ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET –PROPOSED FINAL

Individual Permit: AK0053694 – ExxonMobil Alaska Production, Inc.
Point Thomson Qiruk Camp

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Wastewater Discharge Authorization Program
555 Cordova Street
Anchorage, AK 99501

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Proposed issuance of an Alaska Pollutant Discharge Elimination System (APDES) permit to:

EXXONMOBIL ALASKA PRODUCTION, INC.

For wastewater discharges from:

Point Thomson Qiruk Camp
Point Thomson Unit, Central Pad
Latitude: 70.1713; Longitude: -146.2568
Lion Bay, Beaufort Sea, Alaska

The Alaska Department of Environmental Conservation (Department or DEC) proposes to reissue APDES individual Permit AK0053694 – ExxonMobil Alaska Production Inc. (EMAP), Point Thomson Qiruk Camp (Permit). The Permit authorizes and sets conditions on the discharge of pollutants from this facility to waters of the United States. In order to ensure protection of water quality and human health, the Permit places limits on the types and amounts of pollutants that can be discharged from the facility and outlines best management practices to which the facility must adhere.

This fact sheet explains the nature of potential discharges from the Seawater Treatment Facility and the development of the Permit including:

- information on public comment, public hearing, and appeal procedures,

- a listing of proposed effluent limitations and other conditions,
- technical material supporting the conditions in the Permit, and
- proposed monitoring requirements in the Permit.

Appeals Process

The Department has both an informal review process and a formal administrative appeal process for final APDES permit decisions. An informal review request must be delivered within 20 days after receiving the Department's decision to the Director of the Division of Water at the following address:

Director, Division of Water

Alaska Department of Environmental Conservation
555 Cordova Street, 3rd Floor
Anchorage AK, 99501

Interested persons can review 18 AAC 15.185 for the procedures and substantive requirements regarding a request for an informal DEC review. See http://dec.alaska.gov/commish/review-guidance/informal-reviews for information regarding informal reviews of DEC decisions.

An adjudicatory hearing request must be delivered to the Commissioner of the Department within 30 days of the permit decision or a decision issued under the informal review process. An adjudicatory hearing will be conducted by an administrative law judge in the Office of Administrative Hearings within the Department of Administration. A written request for an adjudicatory hearing shall be delivered to the Commissioner at the following address:

Commissioner

Alaska Department of Environmental Conservation
P.O. Box 111800
Juneau AK, 99811-1800

Interested persons can review 18 AAC 15.200 for the procedures and substantive requirements regarding a request for an adjudicatory hearing. See http://dec.alaska.gov/commish/review-guidance/adjudicatory-hearing-guidance for information regarding appeals of DEC decisions.

Documents are Available

The Permit, Fact Sheet, application, and related documents can be obtained by visiting or contacting DEC between 8:00 a.m. and 4:30 p.m. Monday through Friday at the addresses below. The Permit, Fact Sheet, application, and other information are located on the Department's Wastewater Discharge Authorization Program website: http://dec.alaska.gov/water/wastewater/.

Alaska Department of Environmental Conservation
Division of Water
Wastewater Discharge Authorization Program
555 Cordova Street
Anchorage, AK 99501
(907) 269-6285

Alaska Department of Environmental Conservation
Division of Water
Wastewater Discharge Authorization Program
610 University Avenue
Fairbanks, AK 99709-3643
(907) 451-2183

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1.0 INTRODUCTION\

On March 8, 2018 the Alaska Department of Environmental Conservation (DEC or Department) received an application from ExxonMobil Alaska Production Inc. (EMAP) for reissuance of Alaska Pollutant Discharge Elimination System (APDES) individual permit AK0053694 – EMAP, Point Thomson Qiruk Camp (Permit). This Fact Sheet was developed based on the application and supplemental information (e.g., information supporting antidegradation determinations) obtained through the application process.

1.1 Applicant

This Fact Sheet provides information on the reissuance of the Permit for the following entity:

Name of Facility:	Point Thomson, Qiruk Camp
APDES Permit Number:	AK0053694
Facility Location:	Point Thomson Unit (PTU), Lion Bay, Beaufort Sea, Alaska: Latitude: 70.1713, Longitude: -146.2568
Mailing Address:	P.O. Box 190267 Anchorage, AK 99519
Facility Contact:	Ms. Sofia Laughland

The map in Appendix A to the Fact Sheet shows the location of the treatment plant and the discharge location.

1.2 Authority

The APDES Program regulates the discharge of wastewater to waters of the United States (U.S.). Transfer of authority to administer the National Pollutant Discharge Elimination System (NPDES) Program to Alaska from the Environmental Protection Agency (EPA) occurred in four phases with oil and gas facilities transferring as part Phase IV on October 31, 2012. The state NPDES program is known as the APDES Program and is administered by DEC. Accordingly, DEC is now the permitting authority for regulating the discharges associated with the Permit.

Section 301(a) of the Clean Water Act (CWA) and Alaska Administrative Code (AAC), 18 AAC 83.015 provide that the discharge of pollutants to water of the U.S. is unlawful except in accordance with an APDES permit. The Permit is being reissuance per 18 AAC 83. A violation of a condition contained in the Permit constitutes a violation of the CWA and subjects the permittee of the facility with the permitted discharge to the penalties specified in Alaska Statute (AS) 46.03.760 and AS 46.03.761.

1.3 Permit History

On March 22, 2013 DEC first issued the Permit (2013 Permit) to EMAP to support both construction activities of the Qiruk Camp and the initial period of operation. At the time the 2013 Permit was issued, effluent characterization was based on performance of similar systems elsewhere on the North Slope, which indicated effluent would likely meet water quality criteria at the point of discharge. Accordingly, mixing zones were not sought as they were considered unnecessary. Two sets of limits were established based on water quality criteria for either freshwater or marine water because EMAP desired flexibility as the final design for construction had not been completed. Given the need to verify the assumption that effluent met either freshwater or marine water quality criteria, the 2013 Permit required effluent monitoring to effectively characterize the effluent prior to submitting an application for the first

reissuance. Based upon characterization data obtained during the initial permit term, EMAP and DEC determined that the effluents would not meet either marine or freshwater water quality criteria for certain parameters and a mixing zone would be required in the reissued Permit. Furthermore, because the unnamed freshwater lake was insufficiently sized to provide for the necessary dilution over the life of the facility, EMAP decided to redirect the discharges to Lion Bay and construct a marine outfall line designed in conjunction with a mixing zone model evaluation submitted with the application received in March 2018 prior to expiration of the 2013 Permit. Based on this timely and complete application submittal, DEC administratively extended the 2013 Permit until the marine outfall was constructed and the Permit reissued by DEC. Construction of the marine outfall line was completed in April, 2019.

2.0 BACKGROUND

2.1 Facility Information

EMAP is the operator of the PTU, located on the North Slope of Alaska. The Initial Production System (IPS) at Point Thomson includes: producing natural gas and liquid condensate from the Thomson Sand reservoir; recovering liquid condensate; re-injecting the residual gas back into the reservoir, and transporting the condensate via the Point Thomson Export Pipeline (PTEP) for delivery to the Trans Alaska Pipeline System (TAPS).

The Point Thomson Operations Camp (PTOC or Qiruk Camp) was formerly known as Construction Camp #2 (CC2) during facility construction and is sized to accommodate up to 200 people. The Qiruk Camp is located at the southeast corner of Central Pad and includes staff housing, operation facilities, a drinking water treatment plant (WTP) and a domestic wastewater treatment plant (WWTP) to support camp population. During construction, EMAP chose to discharge wastewater from the WTP and WWTP to the nearby freshwater lake through a single port diffuser (effluent discharge pipe) that commingled the WTP and WWTP effluent. Now, the commingled discharge is directed to Lion Bay through a recently constructed marine effluent outfall 004_{AB} as described in the following sections (See Figure 1, Figure 2, Figure 3, and Figure 4.

2.2 Treatment System Descriptions

2.2.1 Wastewater Treatment Plant System

The WWTP is rated to treat 0.022 million gallons per day (mgd) and meets the minimum treatment, secondary treatment standards, per 18 AAC 72.050. Sewage is delivered to the WWTP via lift stations or vacuum trucks and is stored in a 10,000 gallon flow equalization (FE) tank after receiving primary screening; the FE tank is aerated and mixed with fine-bubble diffusers. Primary screenings and wasted biological solids are processed through a filter press and disposed in an appropriate manner. Secondary biological treatment is provided by a 10,000-gallon membrane bioreactor (BR) that is aerated and mixed with fine bubble diffusers, after which the mixed liquor from the BR is treated via a tubular ultrafiltration (UF) membrane loop with the concentrate/reject waste recycled back to the aeration basin and permeate stored in a holding tank. Upon reaching the setpoint level in the 750-gallon permeate holding tank to actuate the discharge a pump, the treated effluent is discharged (Outfall 004A) at a typical 35 gallons per minute (gpm) to Lion Bay after receiving inline ultraviolet disinfection. The effluent is monitored for compliance with limits and for characterization prior to any commingling with effluent from the WTP. Periodically, the UF membranes are cleaned-in-place (CIP) using acid, caustic, and chlorine. When necessary, chlorine in this waste stream is neutralized using sodium metabisulfite prior to being recycled back to the BR. Hence, the CIP waste is not discharged directly (See Figure 5).

2.2.2 Water Treatment Plant System

The WTP receives raw surface water via haul truck from a nearby freshwater, C-1 lake (not the unnamed lake effluent is discharged to), and is treated using a nanofiltration (NF) system. The raw water offloaded from the truck is stored in six 5,000-gallon holding tanks. Prior to the NF system, the raw water is screened and heated, if necessary, to enhance the treatment efficiency via increasing the flux across the nanofilters that are capable of producing permeate with 0.01 nephlometric turbidity units (NTUs). From the permeate tank, the nano-filtered water passes through carbon filters, receives ultraviolet disinfection, and is dosed with hypochlorite to maintain free residual chlorine in the distribution system.

The reject water from the NF system is stored in a 105-gallon concentrate tank prior to being discharged at a typical pump rate of 25 gpm through Outfall 004B. Approximately every quarter, the NF system must be CIP using citric acid. The cleaning solution and filter foulants are captured in tank to allow for neutralization. However, the cleaning solution is not discharged through Outfall 004B. Instead, the neutralized solution is routed back to the WWTP BR and ultimately discharged with treated domestic wastewater through Outfall 004A (See Figure 6).

2.2.3 Batch Discharges of Outfall 004A and 004B Through Common Effluent Line

As stated previously, EMAP's operation procedures are based on maximizing injection of NF concentrate and treated domestic wastewater into the existing underground injection control (UIC) wells. However, EMAP is not able to consistently inject all wastewater and must maintain the ability to discharge wastewater through a common single marine effluent line. When injection is not possible, discharges from either Outfall 004A or 004B may occur. Although unlikely, a simultaneous discharge of both Outfall 004A and 004B is possible.

Both the WTP and the WWTP discharge effluent in batches with the frequency based on the number of people housed at the Qiruk Camp; approximately 75 people at site during typical operations. For the WTP (Outfall 004B), discharges occur only during treatment, approximately eight times over a two-hour operating period at a typical pump rate of 25 gpm. There may be three to four operating periods per day that produce approximately 500 to 800 gallons per operating cycle, or up to 2,000 to 3,200 gallons per day (gpd). For the WWTP, the treated domestic wastewater is held in a 750-gallon tank and may be discharged twice per day at a typical 35-gpm pump rate when injection is not permissible. The two internal outfalls are commingled downstream of the holding tank/pump systems after the last treatment unit for each waste stream. On occasion, the discharge from both holding tank/pump systems could occur simultaneously and result in an instantaneous discharge rate of 60 gpm in the combined outfall 004_{AB} (See MZ Section 3.3).

2.3 Effluent Characterization

During the term of the 2013 Permit, EMAP was required to conduct additional monitoring on a semiannual frequency for water quality parameters that were not included in the routine sampling of effluent for compliance with limits but are needed to adequately characterize the effluent for future permit reissuances. Because the discharge was initially to freshwater, these additional parameters were aligned with freshwater water quality criteria. As mentioned previously, once EMAP determined a mixing zone was needed and the unnamed freshwater lake was determined to be insufficient for long-term dilution needs, additional samples were collected to account for marine parameters that were not also freshwater parameters (e.g., salinity). Table 1 and Table 2 present characterization data for those parameters that were routinely monitored for compliance with limits and those additional parameters

applicable to marine water quality criteria needed for evaluating a marine mixing zones and potentially in the reasonable potential analysis (RPA) and water quality based effluent limits (WQBELs). Note that parameters that were consistently below detection limits and applicable water quality criteria have been excluded from the characterization tables.

2.3.1 Treated Domestic Wastewater Characterization

The 2013 Permit included monitoring of influent and effluent for five-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS) for determining compliance with maximum daily limits (MDLs), average monthly limits (AMLs), and 85 percent (%) removal requirements as technology-based effluent limits (TBELs). The 2013 Permit also required compliance with mass loading limits BOD_5 and TSS but monitoring results for these items are discussed in Section 2.3.1.1 but are not included in Table 1. For WQBELs, the effluent was monitored for compliance with water quality criteria for dissolved oxygen (DO) and fecal coliform (FC) bacteria in units of FC per 100 milliliters (FC/100 ml). Note, monitoring for enterococci (EC) bacteria measured in colony forming units per 100 ml (CFU/100 ml) was not required in the 2013 Permit. Lastly, the 2013 Permit required monitoring for other marine water quality parameters for the purpose of characterizing the effluent. Table 1 presents a summary of the pertinent characterization data for the treated domestic wastewater effluent during the reporting period May 2013 through September 2017 and the summary of data collected for compliance with effluent limits.

Table 1: Effluent Characterization for WWTP (Outfall 004A)

Parameter (Units)	Data Set	Criteria		Existing Limits		Observed Range (Low – High, Ave) [1]
		Acute	Chronic	MDL	AML	
Flow (mgd)	49	--		0.022	0.011	.005 – 0.0219, 0.0103
pH [2] ((Standard Units (su))	98	6.5 ≤ pH ≤ 8.5		6.5 ≤ pH ≤ 8.5		6.6 – 8.4, 7.55
TSS (Milligrams per Liter (mg/L))	48 [3]	--	--	60	30	0.41 – 6.0, 1.19
BOD_5 (mg/L)	49	--	--	60	30	2.0 – 8, 2.4
FC Bacteria (FC/100mL) [4]	49	40	20	40	20	1 – 2, 1.76 [4]
DO (mg/L) [5]	98	17	7	17	7	***6.9*** – 12.8, 7.84
Arsenic (Micrograms per Liter (µg/L)) [6, 7]	8	69	36	--	--	< 0.5 - < *60*, 8.6
Copper (µg/L) [6]	7	4.8	3.1	--	--	*9.2 – 78, 45.5*
Lead (µg/L) [6, 8]	8	210	8.1	--	--	< 0.08 – < *28.5*, 3.85
Mercury (µg/L) [6, 9]	8	2	1	--	--	< 0.1 - <0.3, < 0.21
Zinc (µg/L) [6]	8	90	81	--	--	63.8 – *189.2, 119.8*

Notes:

1. Values that exceed applicable water quality criteria are presented are italicized. Values that exceed applicable limits are shown in bold.
2. The median of pH is presented in lieu of average.
3. An anomalously high result of 163 mg/L was removed as an outlier based on repeat samples showing non-detectable results.
4. The criteria shown in the acute column represent maximum criteria that may not be exceeded more than 10 % of the time. The criteria shown in the chronic column is based on a 30-day geometric mean. Averages for FC bacteria are presented as a geometric mean.
5. Limits are based on meeting DO criteria of no less than 7 and no greater than 17 mg/L.
6. All metals are in dissolved forms except mercury which is in total.
7. All but two arsenic results were below method detection levels.
8. All but three lead results were below method detection levels.
9. All mercury results were below method detection levels.

2.3.1.1 TSS and BOD_5

During the period of review, both TSS and BOD_5 were well below the TBELs based on concentration as well as the mass loading limits; the mass-based MDLs were 5.5 pounds per day (lbs/d) for both TSS and BOD_5. Although the mass-based result for TSS and BOD_5 are not shown in Table 1, they were significantly less than limits. For the 49 data points for BOD_5, the maximum loading was 0.65 lbs/d and the average was 0.12 lbs/d. The maximum reported TSS was 0.36 lbs/d and the average was 0.01 lbs/d. The maximum reported results for mass-based limits represent 12 % and 6.5 % of the MDLs for BOD_5 and TSS, respectively. The maximum BOD_5 mass discharge is 10.4 ounces per day (oz/d) and for TSS it is 5.8 oz/d. Continuation of the existing mass-based limits for BOD_5 and TSS does not appear necessary for controlling these pollutants when compared to concentration-based limits imposed under 18 AAC 72 – Wastewater Disposal. A reconsideration of the applicability of mass-based TBELs is discussed in Appendix C.

The 2013 Permit required compliance with the 85 % removal requirements for BOD_5 and TSS that is commonly applied to Publically-owned Treatment Works (POTWs). Membrane bioreactors (MBRs) are known to have much higher performance ratings for removal of BOD_5 and TSS due to the solids barrier provided by the membranes. During the period of review, the removal efficiency for BOD_5 was 96.4 % minimum and averaged 99.6 %. Similarly, the removal efficiency for TSS was 96.1 % minimum and 99.7 % average. Note that the removal efficiency does not include an anomalously high TSS value (163 mg/L) in September 2016 that was removed as a sampling outlier as repeat samples collected were near the detection limit. Similar to the mass loading requirements, the applicability of the % removal requirement is reconsidered in Appendix C.

2.3.1.2 Dissolved Oxygen

During the term of the 2013 Permit, EMAP had to modify operation to ensure the minimum level of DO was met in the discharge. In order to control the oxygen level, EMAP cooled the effluent and on occasions inject hydrogen peroxide to increase DO. During the period of review, the minimum DO was not attained one time and was reported as 6.9 mg/L. Now that a mixing zone is proposed, the implications of low DO is no longer an issue given the discharge will be to marine water that has a high ambient DO concentration. Hence, the DO minimum will be met quickly upon mixing with the receiving water and will not be a driving parameter for sizing the chronic mixing zone nor require an WQBEL in the reissued Permit (See Appendix C).

2.3.1.3 Metals

Of the metals evaluated in the treated domestic wastewater, only copper and zinc had results that were consistently higher than the method detection levels. Copper appears to be the parameter that requires the most dilution in the mixing zone. However, as discussed in Section 2.3.3, zinc must be evaluated also given there are two combined discharges that will ultimately determine which metal determines the maximum size of the chronic and acute mixing zones. In addition, either copper and/or zinc could exhibit reasonable potential at either mixing zone boundary and require development of a WQBEL in the Permit (See Section 2.3.3, Appendix B, and Appendix C).

2.3.2 **NF Concentrate/Flush**

The 2013 Permit included monitoring of TSS in Outfall 004B for determining compliance with concentration-based MDLs and AMLs. Similar to treated domestic wastewater, EMAP conducted additional sampling for metals to evaluate applicable marine water quality parameters to support the switch to a marine discharge. Table 2 presents a summary of the pertinent characterization data for the NF concentrate/flush water during the reporting period May 2013 through September 2017 and supplemented in the application.

Table 2: Effluent Characterization for WTP (Outfall 004B)

Parameter (Units)	Data Set	Criteria		Existing Limits		Observed Range (Low – High, Ave) [1]
		Acute	Chronic	MDL	AML	
Flow (mgd)	49	--		--	--	.002 – 0.00419, 0.0028
pH [2] (su)	98	6.5 ≤ pH ≤ 8.5		6.5 ≤ pH ≤ 8.5		7.2 – 8.1, 7.70
TSS (mg/L)	47 [3]	--	--	60	30	0.5 – 24.0, 4.22
Arsenic (µg/L) [3, 7]	7	69	36	--	--	0.82 - < 2.50, 1.43
Copper (µg/L) [3]	7	4.8	3.1	--	--	1.3 – 2.7, 1.89
Lead (µg/L) [3, 8]	8	210	8.1	--	--	< 0.0897 – < 0.95, <0.312
Manganese (µg/L) [3, 8]	7	--	--	--	--	17.0 – 104, 41.0
Mercury (µg/L) [3, 9]	8	2	1	--	--	< 0.1 - < 1, < 0.321
Zinc (µg/L) [3]	8	90	81	--	--	4 – 11.7, 6.79

Notes:

1. Values that exceed applicable water quality criteria are presented are italicized. Values that exceed applicable limits are shown in bold.
2. The median of pH is presented in lieu of average.
3. All metals are in dissolved forms except mercury which is in total.
4. All but three arsenic results were below method detection levels.
5. All but one lead results were below method detection levels.
6. All mercury results were below method detection levels.

2.3.2.1 TSS

During the period of review, TSS were well below the established TBELs. However, there was one result, 24 mg/L, that seemed anomalously high although not significantly. The TBELs appear to be appropriate based on the data reviewed.

2.3.2.2 Metals

None of the metal results exceeded marine water quality criteria. However, because this waste stream may be commingled and discharged into a single mixing zone, it is necessary to include copper and zinc in a mass-balance evaluation to estimate the maximum expected concentrations in the combined discharge for purposes of the mixing zone evaluation and RPA and WQBEL development procedures.

2.3.3 **Mass-Balance of Copper and Zinc Concentrations**

The characterization data for metals for both Outfall 004A and 004B indicate copper or zinc could have the highest dilution requirements in the receiving water to meet applicable acute and chronic criteria once combined and discharged. In order to evaluate which of these are the driving parameters for the acute or chronic mixing zone, DEC performed a mass balance calculation that

results in a flow-weighted estimate of the maximum observed concentration (MOC) of each metal representative of the combined effluent. The general equation is as follows:

$$(Q_A + Q_B)MOC_{\overline{AB}} = Q_A MOC_A + Q_B MOC_B$$

For the flows, DEC uses the pump rates discussed in Sections 2.2.1 and 2.2.2 for the WTP and the WWTP, 25 gpm and 35 gpm, respectively. For concentrations, the maximum observed concentrations for copper and zinc in Outfalls 004A and 004B were used. Based on the mass-balance calculation, the flow-weighted average maximum observed copper dissolved concentration, $MOC_{\overline{AB}}$, based on the observed maximums in Table 1 and Table 2 is 46.6 µg/L. For zinc, the flow-weighted concentration is 115.2 µg/L. Given the low dissolved acute and chronic criteria for copper, 4.8 µg/L and 3.1 µg/L, respectively, the required acute and chronic dilution is an order of magnitude higher than that for zinc with acute and chronic criteria of 90 µg/L and 81 µg/L, respectively. The acute dilution for the observed combined copper concentration is 9.7; whereas, the required acute dilution for zinc is 1.4. The required chronic dilution for copper is 15; whereas, the required chronic dilution for zinc is 1.3. Note that these dilution estimates are presented as indicators and do not account for variability multipliers used for estimating the maximum expected concentrations for the mixing zone or RPA. However, the multipliers for copper and zinc will not be significantly different given the data sets consist of either seven or eight data points. Therefore, copper is presumed to drive both the acute and chronic mixing zones and will require a copper WQBEL for each contributing internal outfall.

2.3.4 Human Health Parameters

Although not discussed in Section 2.3.1 or 2.3.2, human health criteria was considered when characterizing the effluent from the WWTP and WTP. DEC considered the numeric human health criteria for copper, manganese, mercury, and zinc to the average concentrations for those parameters. This comparison indicated that the average concentrations were significantly lower than the human health criteria such that presenting the information is not meaningful because human health criteria is met either at the point of discharge or quickly within the mixing zone authorized for the combined discharge from 004A and 004B. Hence, it is not possible for these parameters to be the driving parameters for sizing the chronic mixing zone based on human health criteria. However, because one data point for manganese exceeded the HHC, manganese is listed as a parameter to be included in the chronic mixing zone.

2.4 Compliance History

2.4.1 Permit Limit Exceedances

During the period of review, EMAP had exceedances three times. The first exceedance was elevated TSS on Outfall 004A. Per note 3 in Table 1, the exceedance was attributed to failure to adequately clean a sample port prior to sample collection. There were no other parameters involved but this one anomalous sample result triggered seven other exceedances on the Discharge Monitoring Reports (DMRs) (e.g., AML, % removal, etc.). On another occasion, the minimum DO was not attained in Outfall 004A and EMAP modified operations to ensure future compliance (See Section 2.3.1.2). Lastly, the WWTP exceeded the AML of 0.011 mgd for flow reporting 0.012 mgd on the DMR.

2.4.1 Non-Receipt Violations

In January 2015, EMAP failed to submit a timely DMR and did not include one of the AMLs. These minor reporting violations have been resolved.

3.0 RECEIVING WATERBODY

3.1 Water Quality Standards

Section 301(b)(1)(C) of the CWA requires the development of limitations in permits necessary to meet water quality standards by July 1, 1977. Per 18 AAC 83.435, APDES permits must include conditions to meet 18 AAC 70– Alaska Water Quality Standards (WQS). The WQS are composed of waterbody use classifications, numeric and/or narrative water quality criteria, and the state's Antidegradation Policy. The use classification system designates the beneficial uses that each waterbody is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the state to support the beneficial use classification of each waterbody. The Antidegradation Policy ensures that the beneficial uses and existing water quality are maintained.

Waterbodies in Alaska are designated for all uses unless the water has been reclassified under 18 AAC 70.230 as listed under 18 AAC 70.230(e). Some waterbodies in Alaska can also have site–specific water quality criterion per 18 AAC 70.235, such as those listed in 18 AAC 70.236(b). The Department has determined that there has been no reclassification nor has site-specific water quality criteria been established at the location of the discharge from the permitted facility into Lion Bay. Accordingly, the Department has determined that all marine use classes must be protected. These marine use classes include: water supply; water recreation; growth and propagation of fish, shellfish, other aquatic life, and wildlife; and harvesting for consumption of raw mollusks or other raw aquatic life.

3.2 Water Quality Status of Receiving Water

Any part of a waterbody for which the water quality does not or is not expected to meet applicable WQS is defined as a "water quality limited segment" and placed on the state impaired waterbody list. For an impaired waterbody, Section 303(d) of the CWA requires states to develop a Total Maximum Daily Load (TMDL) management plan for the waterbody. The TMDL documents the amount of a pollutant a waterbody can assimilate without violating WQS and allocates that load to known point sources and nonpoint sources.

Beaufort Sea is classified as Category 2 waterbody on *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report,* July 15, 2010. The Beaufort Sea is not listed as an impaired waterbody nor is the subject waterbody listed as a CWA 303(d) waterbody requiring a TMDL. Accordingly, no TMDL has been developed for the subject waterbody.

3.3 Mixing Zone Analysis

Per 18 AAC 70.240 – 70.270, as amended through June 23, 2003, the Department may authorize a mixing zone in a permit. EMAP submitted a mixing zone application in February 2018 requesting a separate set of mixing zones, one for each internal outfall that is commingled into a single effluent discharge line. The chronic mixing zone for Outfall 004A would be based on copper as the driving parameter and for Outfall 004B the driving parameter would be manganese. This request assumes that the discharges would rarely occur simultaneously. However, the possibility exists that both discharges could occur simultaneously based on the current physical configuration and independent discharge control systems. DEC must ensure that all water quality criteria is met at, and beyond, the boundary of

the chronic mixing zone. Unfortunately, DEC cannot guarantee that this requirement would be met with the requested mixing zone sizes should both discharges occur simultaneously. Therefore, DEC has used the mixing zone evaluation provided by the applicant to authorize a single chronic mixing zone and a single acute mixing zone for the parameter that requires the most dilution, respectively, based on mass-balance. Using mass-balance, the driving parameter for both the acute and chronic mixing zones was determined to be copper, with a probable maximum concentration after commingling of 164 µg/L. All other mixing zone model inputs developed by the applicant were deemed appropriate. Hence, the prevailing current direction, salinity profile, and current speed (0.03 meters per second (m/s)), and outfall configuration were used as presented in the application. The mixing zone output file from the application titled "Bay1 Combined" was used for sizing the chronic and acute mixing zones.

Appendix D, Mixing Zone Analysis Checklist, outlines criteria per mixing zone regulations that must be considered when the Department reviews an application for mixing zones. These criteria include the size of the mixing zone, treatment technology, and existing uses of the waterbody, human consumption, spawning areas, human health, aquatic life, and endangered species. The following subsections summarize the Department's regulatory mixing zone analysis.

3.3.1 Size

The authorized chronic mixing zone is semi-cylindrical extending from the seafloor to the sea surface with a 46 meter radius and a chronic dilution factor of 51.5. The parameters authorized in the chronic mixing zone include copper, zinc, manganese, temperature, and DO. The authorized acute mixing zone is semi-cylindrical extending from the seafloor to the sea surface with a 30.5 meter radius and a dilution factor of 31.0. The listed parameters for the acute mixing zone are copper and zinc.

Per 18 AAC 70.255, the Department determined that the chronic and acute mixing zone size for each wastewater discharge is appropriate and as small as practicable. The size of the mixing zones are a small fraction of the area, or width of the Beaufort Sea. Using the 10^{th} percentile current velocity of 0.03 m/s, a drifting organism can traverse the acute mixing zone associated with Outfall 004_{AB} in less than 17 minutes. Typically, 15 minutes is used as a preliminary check for lethality. However, given the combined discharge rarely has both outfalls operating simultaneously, it is reasonable to conclude that exceeding 15 minutes in the acute mixing zone will also be infrequent such that lethality is not likely to occur. Applicable water quality criteria representing the most stringent use classification are met at the boundary of the chronic mixing zone and beyond. Given the low concentrations of pollutants, rapid dispersion of the discharge plume and the absence of sensitive aquatic resources within the vicinity, the mixing zones are determined to be protective of aquatic life.

3.3.2 Technology

Per 18 AAC 70.240(a)(3), the Department is required to determine if "an effluent or substance will be treated to remove, reduce, and disperse pollutants, using methods found by the Department to be the most effective and technologically and economically feasible, consistent with the highest statutory regulatory treatment requirements" before authorizing a mixing zone. Applicable "highest statutory and regulatory requirements" are defined in 18 AAC 70.990(30) [2003]. Accordingly, there are three parts to the definition, which are:

- Any federal TBEL identified in 40 CFR 125.3 and 40 CFR 122.29, as amended through August 15, 1997, adopted by reference at 18 AAC 83.010;
- Minimum treatment standards in 18 AAC 72.040; and

- Any treatment requirement imposed under another state law that is more stringent than the requirement of this chapter.

The first part of the definition includes all applicable federal technology-based Effluent Limitation Guidelines (ELGs) that may be adopted by reference at 18 AAC 83.010(g)(3) or TBELs developed using case-by-case Best Professional Judgment (BPJ). There are no ELGs that apply to the Permit. However, the Permit includes a TBEL for TSS developed using case-by-case BPJ for Outfalls 004B. TBELs developed for Outfall 004A using case-by-case BPJ is associated with the second part of the definition for minimum treatment standards. The Department determines that the first part of the definition has been met.

The second part of the definition from the WQS appears to be in error, as 18 AAC 72.040 considers discharge of sewage to sewers and not minimum treatment. The correct reference appears to be 18 AAC 72.050, minimum treatment for domestic wastewater. The application of 18 AAC 72.050 has been implemented by developing TBELs using case-by-case BPJ for BOD_5 and TSS specifically for meeting the definition of secondary treatment standards under 18 AAC 72.

The third part of the definition includes any treatment required by state law that is more stringent than 18 AAC 70. Other regulations beyond 18 AAC 70 that may apply to this permitting action include 18 AAC 83, 18 AAC 72 and 18 AAC 15. The Permit is consistent with 18 AAC 83 and neither the regulations in 18 AAC 15, 18 AAC 72, nor another state legal requirement that the Department is aware of impose more stringent treatment requirements than 18 AAC 70. Therefore, the third and final part of the definition has also been met.

3.3.3 Existing Use

Per 18 AAC 70.245, the mixing zone has been appropriately sized to fully protect the existing uses of the Beaufort Sea. Water quality criteria are developed to ensure protection of existing uses. The chronic mixing zones have been appropriately sized to ensure water quality criteria will be met at, and beyond, the boundary of the chronic mixing zone and that regulatory mixing zone size requirements have been met. Accordingly, the mixing zones result in the protection of the existing uses of the waterbody as a whole.

3.3.4 Human Consumption

Per 18 AAC 70.250(b)(2) and (b)(3), the pollutants discharged cannot produce objectionable color, taste, or odor in aquatic resources harvested for human consumption; nor can the discharge preclude or limit established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting. The mixing zone is not at a location where aquatic resources are harvested or that could result in precluding or limiting established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting. In addition, there is no indication that the pollutants discharged could produce objectionable color, taste, or odor in aquatic resources harvested for human consumption if such resources existing at the location of the mixing zone.

3.3.5 Spawning Areas

Per 18 AAC 70.225(h), a mixing zone is not authorized in an area of anadromous fish spawning or resident fish for spawning redds, Arctic grayling (*Thymallus arcticus*), northern pike (*Esox lucius*), inconnu/sheefish (*Stenodus leucichthys*) and all other whitefish in Alaska belonging to genera *Prosopium* and *Coregonus,* Arctic char (*Salvelinus alpinus*), Dolly Varden (*S. malma*), brook trout (*S. fontinalis*), rainbow trout (*Oncorhynchus mykiss*), cutthroat trout (*O.clarkii*), burbot *Lota*, landlocked coho salmon (*O. kisutch*), Chinook salmon (*O. tshawytscha*), and sockeye salmon (*O. nerka*). The Permit does not authorize the discharge of effluent to open waters of a freshwater lake,

river, or other flowing freshwater. Therefore, there are no associated discharges to anadromous fish spawning areas or the resident freshwater fish listed in the regulation.

3.3.6 Human Health

Per 18 AAC 70.250 and 18 AAC 70.255, the mixing zone authorized in the Permit shall be protective of human health. Per 18 AAC 70.250(d)(1), the Department has the authority to authorize mixing zones such that pollutants do not bioaccumulate, bioconcentrate, or persist above natural levels in sediments, water, or biota to significantly adverse levels. Given the characteristics of the effluent discharged through Outfalls 004A and 004B, there are no indications that the discharges include pollutants that could bioaccumulate, bioconcentrate, or persist above natural levels in sediments, the receiving water, or biota. The Department determines that the discharges are protective of human health.

3.3.7 Aquatic Life and Wildlife

Per 18 AAC 70.250 and 18 AAC 70.255, the mixing zone authorized in the Permit shall be protective of aquatic life and wildlife and will not result in concentrations outside of the mixing zone that are undesirable, present a nuisance to aquatic life, permanent or irreparable displacement of indigenous organisms, or a reduction in fish or shellfish population levels. Based on the characteristics of the effluent in Outfalls 004A and 004B, the unlikelihood of simultaneously discharging through both outfalls, and size of the acute mixing zone for copper in Outfall 004_{AB}, there is no anticipation of lethality to drifting organisms. Nor do the effluent characteristics indicate there will be undesirable nuisance aquatic life effects or displacement, or reduction, of existing aquatic life outside the mixing zones. The Department therefore concludes aquatic life and wildlife will be maintained and protected.

3.3.8 Endangered Species

Per 18 AAC 70.250(a)(2)(D), the authorized mixing zone will not cause an adverse effect on threatened or endangered species. Species that have some potential to be in the vicinity of the Qiruk Camp and are listed under the Endangered Species Act (ESA) are discussed in Section 8.1.

4.0 EFFLUENT LIMITS AND MONITORING REQUIREMENTS

4.1 Basis for Effluent Limitations

Per 18 AAC 83.015, the Department prohibits the discharge of pollutants to waters of the U.S. unless the permittee has first obtained a permit issued by the APDES Program that meet the purposes of AS 46.03 and is in accordance with the CWA Section 402. Per these statutory and regulatory provisions, the Permit includes effluent limits that require the discharger to (1) meet standards reflecting levels of technological capability, (2) comply with 18 AAC 70 –WQS, and (3) comply with other state requirements that may be more stringent. The CWA requires that the limits for a particular pollutant be the more stringent of either TBELs or WQBELs. The Permit includes TBELs for BOD_5 and TSS on Outfall 004A and TSS on Outfall 004B. In addition, there are WQBEL limits for copper and pH on both Outfalls 004A and 004B. For more information concerning the basis of limits, see Appendix C.

4.2 Effluent Limits and Monitoring Requirements

Per AS 46.03.110(d), the Department may specify the terms and conditions for discharging wastewater in a permit. The Permit includes monitoring requirements so that compliance with effluent limits can be determined and to characterize the effluent. Sufficiently sensitive methods as required in 40 CFR 136 are required for analyzing collected samples. The permittee must report all violations of MDLs per Appendix A, Standard Conditions, Section 3.4 – 24-Hour Reporting. Violations of all other effluent limits are to be reported per Appendix A, Standard Conditions, Section 3.5 – Other Noncompliance Reporting. The following sections summarize the effluent limits and monitoring requirements for internal Outfalls 004A and 004B.

4.2.1 Effluent Limits and Monitoring Requirements for Outfall 004A - WWTP

Effluent limits and monitoring requirements for Outfall 004A – WWTP are summarized in Table 3.

Table 3: Effluent Limits and Monitoring Requirements for WWTP (Outfall 004A)

Parameter (Units)	Effluent Limits		Monitoring Requirements	
	MDL	AML	Frequency	Sample Type
Flow (mgd)	0.022	0.011	Continuous	Calculation or Meter
pH (su)	$6.5 \leq pH \leq 8.5$		1/week	Grab or Meter
TSS (mg/L)	60	30	1/month	Grab
BOD_5 (mg/L)	60	30	1/month	Grab
Total Recoverable Copper (µg/L) [4.2.1.1]	270	135	3/quarter	Grab
Total Recoverable Zinc (µg/L)	Report		1/Quarter	Grab
EC Bacteria (CFU/100 ml)	Report		1/Quarter	Grab
FC Bacteria (FC/100 ml)	Report		1/Quarter	Grab

Notes:

1. The Permittee must maintain a daily operating log for the WWTP that records daily flows and weekly pH concentrations in the effluent. The logged data must be made available to DEC upon request.

4.2.1.1 Copper Monitoring

The monitoring frequency for copper is three times per quarter with a minimum of 20 days between samples. On the DMR, report the maximum as the MDL and the average as the AML. Sampling quarters are defined as January-March, April-June, July-September and October- December.

4.2.1.2 CIP Waste Neutralization

The permittee must develop and implement a specific best management practice (BMP) to ensure adequate neutralization of CIP waste prior to introducing it into the WWTP MBR to protect the treatment system microbiology. See Sections 7.1 and 7.3.1.1.

4.2.2 Effluent Limits and Monitoring Requirements for Outfall 004B - WTP

Effluent limits and monitoring requirements for Outfall 004B – WTP are summarized in Table 4.

Table 4: Effluent Limits and Monitoring Requirements for WTP (Outfall 004B)

Parameter (Units)	Effluent Limits		Monitoring Requirements	
	MDL	AML	Frequency	Sample Type
Flow (mgd)	Report	Report	Continuous	Calculation or Meter
pH (s)	6.5 ≤ pH ≤ 8.5		1/week	Grab or Meter
TSS (mg/L)	60	30	1/month	Grab
Total Recoverable Copper (µg/L) [4.2.2.1]	9.5	4.7	3/quarter	Grab

Notes:

1. The Permittee must maintain a daily operating log for the WTP that records daily flows and weekly pH concentrations in the effluent. The logged data must be made available to DEC upon request.

4.2.2.1 Copper Monitoring

The monitoring frequency for copper is three times per quarter with a minimum of 20 days between samples. On the DMR, report the maximum as the MDL and the average as the AML. Sampling quarters are defined as January-March, April-June, July-September and October- December.

4.2.2.2 NF Cleaning Waste Neutralization

The permittee must develop and implement a specific BMP to ensure adequate neutralization of NF cleaning waste prior to introducing it into the WWTP MBR to protect the treatment system microbiology. See Sections 7.1 and 7.3.1.2.

4.3 Electronic Discharge Monitoring Reports

4.3.1 E-Reporting Rule, Phase I (DMRs)

The permittee must submit a DMR for each month by the 28th day of the following month. DMRs shall be submitted electronically through NetDMR per Phase I of the E-Reporting Rule (40 CFR 127). Authorized persons may access permit information by logging into the NetDMR Portal (http://cdxnodengn.epa.gov/oeca-netdmr-web/action/login). DMRs submitted in compliance with the E-Reporting Rule are not required to be submitted as described in Permit Appendix A – Standard Conditions unless requested or approved by the Department. Any DMR data required by the Permit that cannot be reported in a NetDMR field (e.g. full WET reports, mixing zone receiving water data, etc.), shall be included as an attachment to the NetDMR submittal. DEC has established an e-Reporting Information website (http://dec.alaska.gov/water/compliance/electronic-reporting-rule) that contains general information about this new reporting format. Training materials and webinars for NetDMR can be found at https://netdmr.zendesk.com/home.

4.3.2 E-Reporting Rule, Phase II (Other Reporting)

Phase II of the E-Reporting Rule specifies that permittees will integrate electronic reporting for all other reports required by the Permit (e.g., Annual Reports and Certifications) and implementation is expected to begin during the term of the Permit. Permittees should monitor the DEC E-Reporting website (http://dec.alaska.gov/water/Compliance/EReportingRule.htm) for updates on Phase II of the E-Reporting Rule and will be notified when they must begin submitting all other reports electronically. Until such time, other reports required by the Permit may be submitted in accordance with Permit Appendix A – Standard Conditions.

4.4 Monitoring Frequency Reductions

DEC can reduce monitoring frequencies for selected parameters in a permit for permittees showing a record of good compliance during the previous permit cycle. DEC utilizes the *EPA Interim Guidance For Performance-Based Reduction of NPDES Permit Monitoring Frequencies* (*Frequency Reduction Guidance*) in combination with the consideration of other factors to determine whether or not to reduce monitoring frequencies in a permit. The interim guidance provides the statistical basis for assessing potential reductions and other factors include consideration of the size and type of facility, future data analyses needs, and other issues pertinent to each permit.

The 2013 Permit limits BOD_5 and TSS in the Outfall 004A discharge to an AML of 30 mg/L under normal operating conditions and specifies a sampling frequency of once per week and pH to three times per week. Review of DMR data under normal operations from May 2013 through September 2017 shows a long-term average for BOD_5 and TSS of 2.4 mg/L and 1.2 mg/L, respectively. These averages equal 8 % and 4 % of the AML of their respective limits and when assessed per the *Frequency Reduction Guidance*, the monitoring frequency can potentially be reduced to twice per year in the Permit. Having considered the impacts of monitoring twice per year in light of eliminating % removal, mass-based limits, and other permit reissuance needs, DEC concludes monthly monitoring for BOD_5 and TSS is appropriate during the next term of the Permit. However, the monitoring of pH is reduced to weekly with monthly reporting on the DMR.

The 2013 Permit limits TSS in the Outfall 004B to an AML of 30 mg/L and specifies a sampling frequency of once per month. Review of DMR data for May 2013 through September 2017 shows a long-term average of 4.2 mg/L equaling 14 % of the AML which, when assessed per the *Frequency Reduction Guidance*, could potentially be reduced to twice per year in the Permit. Similar to Outfall 004A, DEC believes reducing the frequency to once every six months would not provide sufficient information for evaluation during the next reissuance. Therefore, DEC is retaining the frequency for TSS for Outfall 004B in the Permit to once per month. However, similar to Outfall 004A the pH frequency is reduced to weekly monitoring with monthly reporting on the DMR.

4.5 Additional Monitoring

DEC may require additional monitoring of effluent or receiving water for facility or site-specific purposes, including, but not limited to: data to support applications, demonstration of water quality protection, obtaining data to evaluate ambient water quality, and evaluating causes of elevated concentrations of parameters in the effluent. If additional monitoring is required, DEC will provide the permittee or applicant the request in writing.

The permittee also has the option of taking more frequent samples than required under the Permit. These additional samples must be used for averaging and analyzed using the Department approved test methods (generally found in 18 AAC 70 and 40 CFR 136 [adopted by reference in 18 AAC 83.010]). The results of any additional monitoring must be included in the calculation of averages reported on the DMRs as required by the Permit and Standard Conditions Part 3.2 and 3.3 (Permit Appendix A).

Monitoring for effluent limitations must use methods with method detection limits that are less than the effluent limitations or are sufficiently sensitive. Monitoring effluent or receiving water for the purpose of comparing to water quality criteria must use methods that are less than the applicable criteria or are sufficiently sensitive. Per 40 CFR 122.21(a)(3), a method approved under 40 CFR 136 is sufficiently sensitive when:

> (A) The method minimum level (ML) is at or below the level of the applicable water quality criterion for the measured parameter, or

(B) The method ML is above the applicable water quality criterion, but the amount of the pollutant or pollutant parameter in the discharge is high enough that the method detects and quantifies the level of the pollutant or pollutant parameter in the discharge (e.g., not applicable to effluent or receiving water monitored for characterization), or

(C) The method has the lowest ML of the analytical methods approved under 40 CFR 136 for the measured pollutant or pollutant parameter (e.g., the receiving water concentration or the criteria for a given pollutant or pollutant parameter is at or near the method with the lowest ML).

5.0 ANTIBACKSLIDING

Per 18 AAC 83.480, "effluent limitations, standards, or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the previous permit." Per 18 AAC 83.480(c), a permit may not be reissued "to contain an effluent limitation that is less stringent than required by effluent guidelines in effect at the time the Permit is renewed or reissued."

Effluent limitations may be relaxed as allowed under 18 AAC 83.480, CWA §402(o) and CWA §303(d)(4). 18 AAC 83.480(b) allows relaxed limitations in renewed, reissued, or modified permits when there have been material and substantial alterations or additions to the permitted facility that justify the relaxation, or, if the Department determines that technical mistakes were made.

CWA §303(d)(4)(A) states that, for waterbodies where the water quality does not meet applicable WQS, effluent limitations may be revised under two conditions, the revised effluent limitation must ensure the attainment of the WQS (based on the waterbody TMDL or the waste load allocation) or the designated use which is not being attained is removed in accordance with the WQS regulations.

CWA §303(d)(4)(B) states that, for waterbodies where the water quality meets or exceeds the level necessary to support the waterbody's designated uses, WQBELs may be revised as long as the revision is consistent with the state's Antidegradation Policy. Even if the requirements of CWA §303(d)(4) or 18 AAC 83.480(b) are satisfied, 18 AAC 83.480(c) prohibits relaxed limits that would result in violations of WQS or ELGs.

State regulation 18 AAC 83.480(b) only applies to effluent limitations established on the basis of CWA Section 402(a)(1)(B), and modification of such limitations based on effluent guidelines that were issued under CWA Section 304(b). Accordingly, 18 AAC 83.480(b) applies to the relaxation previously established case-by-case TBELs developed using BPJ. To determine if backsliding is allowable under 18 AAC 83.480(b), the regulation provides five potential regulatory criteria (18 AAC 83.480[b][1-5]) that must be evaluated with at least one satisfied.

5.1 Antibacksliding of TBELs

The 2013 Permit included % removal and mass-based TBELs for BOD_5 and TSS for Outfall 004A. Based on review of the characterization data in Section 2.3.1.1, the mass limitations and % removal requirements are not necessary to control the treated domestic wastewater in an appropriately operated MBR. Based on this new information on the MBR performance, DEC is eliminating these TBELs from the Permit as a technical mistake. If DEC had known the performance data at the time of first issuance, these TBELs would not have been imposed. In light of removing these limitations, DEC is retaining monthly monitoring frequencies for BOD_5 and TSS as discussed in Section 4.4.

5.2 Antibacksliding of WQBELs

The 2013 Permit included a WQBEL for DO on Outfall 004A based on meeting water quality criteria at the point of discharge because there was no chronic mixing zone authorized previously. DEC now authorizes a chronic mixing zone for Outfall 004A, which renders the requirement for a WQBEL for DO as unnecessary; the dissolved oxygen in the discharge will meet water quality criteria rapidly in the marine environment such that reasonable potential does not exist that would require a WQBEL for DO. Similarly, the 2013 Permit included limits for FC bacteria based on meeting water quality criteria at the point of discharge. Based on the characterization data in Section 2.3.1, FC bacteria criteria is met at the point of discharge indicating a WQBEL is not appropriate now that a mixing zone has been authorized. Both Outfall 004A and Outfall 004B included a contingency limit for total residual chlorine (TRC) in the 2013 Permit for situations where chlorinated CIP waste was neutralized and commingled with the outfalls discharging directly to the receiving water. This contingency was imposed based on limited information at the time as the facility had not been commissioned. Based on new information contained in the application for reissuance, DEC understands that neutralized CIP waste is recycled into the WWTP MBR where there is significant volume of mixed liquor with high chlorine demand to ensure chlorine is not discharged downstream after the membranes. Therefore, the TRC limits are removed from the Permit. However, the neutralization procedure and verification steps are required as items to be included in the BMP Plan and Quality Assurance Project Plan (QAPP) with verification data included in operational logs to be available for inspection upon DEC request (See Note 1, Table 3). These backsliding considerations are allowable as long as they do not violate an ELG and comply with WQS including the Antidegradation Policy per CWA 303(d)(4). See Section 6.5.2 Finding B for further discussion.

6.0 ANTIDEGRADATION

6.1 Legal Basis

Antidegradation is implicit in CWA Section 101(a) goals, explicitly referenced in CWA Section 303(d)(4)(B), and implemented through 40 CFR 131.12. Section 303(d)(4) of the CWA states that, for waterbodies where the water quality meets or exceeds the level necessary to support the designated uses of the waterbody, WQBELs may be revised as long as the revision is consistent with the State Antidegradation Policy and implementation methods. The current Alaska Antidegradation Policy and Implementation Methods are presented in 18 AAC 70.015 *Antidegradation policy* (Policy) and 18 AAC 70.016 *Antidegradation implementation methods for discharges authorized under the federal Clean Water Act* (Implementation Methods), respectively. For these state regulations to apply under the CWA, they must be previously approved by EPA per CWA Section 303(c)(3). The Policy and Implementation Methods have been amended through April 6, 2018; are consistent with the CWA and 40 CFR 131.12; and were approved by EPA on July 26, 2018.

The following subsections document the Department's conformance with the policy and implementation methods for reissuance of APDES Permit AK0053694.

6.2 Receiving Water Status and Tier Determination

Per the Implementation Methods, the Department determines a Tier 1 or Tier 2 classification and protection level on a parameter by parameter basis. The Implementation Methods also describe a Tier 3 protection level applying to designated waters, although at this time no Tier 3 waters have been designated in Alaska.

The marine waters of Lion Bay of the Beaufort Sea, covered under the Permit, are not listed as impaired (Categories 4 or 5) in the *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report*. Therefore, no parameters have been identified where only the Tier 1 protection level applies. Accordingly, this antidegradation analysis conservatively assumes that the Tier 2 protection level applies to all parameters, consistent with 18 AAC 70.016(c)(1).

Per 18 AAC 70.015(a)(2), if the quality of water exceeds levels necessary to support propagation of fish, shellfish, wildlife, and recreation in and on the water, that quality must be maintained and protected, unless the Department authorizes a reduction in water quality.

Prior to authorizing a reduction of water quality, the Department must first analyze and confirm that the four findings under 18 AAC 70.015(a)(2)(A-D) are met. The analysis must be conducted with Implementation Methods in 18 AAC 70.016(b)(5)(A-C) for Tier 1 protection, and under 18 AAC 70.016(c)(7)(A-F) for Tier 2 protection. These analyses and associated finding are summarized below.

6.3 Tier 1 Analysis of Existing Use Protection

The summary below presents the analyses and findings for the Tier 1 by the Department for the existing use protections per 18 AAC 70.016(b)(5) finding that:

(A) existing uses and the water quality necessary for protection of existing uses have been identified based on available evidence, including water quality and use related data, information submitted by the applicant, and water quality and use related data and information received during public comment;

The Department reviewed water quality data, environmental monitoring studies, and information on existing uses in the vicinity of Outfall 004A – WWTP and Outfall 004B – WTP submitted by the applicant. The Department finds the information reviewed as sufficient to identify existing uses and water quality necessary for Tier 1 protection.

(B) existing uses will be maintained and protected;

Per 18 AAC 70.020 and 18 AAC 70.050, marine waters are protected for all uses. Therefore, the most stringent water quality criteria found in 18 AAC 70.020 and in the *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances, 2008* (*Toxics Manual*) 2008) apply and were evaluated to ensure existing uses and the water quality necessary for protection of existing uses of the receiving waterbody are fully maintained and protected. Water quality criteria is developed such that attainment of the criteria ensures protection of existing uses. The authorized chronic mixing zone is appropriately sized and ensures that all water quality criteria are met at, and beyond, the boundary of the chronic mixing zone. Therefore, the existing uses of the waterbody as a whole are protected.

(C) the discharge will not cause water quality to be lowered further where the department finds that the parameter already exceeds applicable criteria in 18 AAC 70.020(b), 18 AAC 70.030, or 18 AAC 70.236(b).

The Permit will require that the discharge shall not cause or contribute to a violation of WQS. As previously stated the marine waters of Lion Bay covered under this Permit are not listed as impaired. Therefore, no parameters were identified in the receiving water as exceeding the applicable criteria in 18 AAC 70.020(b) or 18 AAC 70.030. Nor have site-specific criteria been established per 18 AAC 70.236(b) for receiving waterbody in the vicinity of the discharge.

The Department concludes the terms and conditions of the Permit will be adequate to fully protect and maintain the existing uses of the water and that the Tier 1 findings required under 18 AAC 70.016(b)(5) are met.

6.4 Tier 2 Applicability

6.4.1 Scope of Tier 2 Analysis

Per 18 AAC 70.016(c)(2), an antidegradation analysis is only required for those waterbodies needing Tier 2 protection and which have any new or existing discharges that are being expanded based on permitted increases in loading, concentration, or other changes in effluent characteristics that could result in comparative lower water quality or pose new adverse environmental impacts. Per 18 AAC 70.016(c)(3), DEC is not required to conduct an antidegradation analysis for a discharge the applicant is not proposing to expand.

Given this Fact Sheet is the basis for reissuing a 2013 Permit authorizing two discharges, DEC reviewed the information provided by the applicant to determine if either of the discharges require a Tier 2 evaluation. The review indicates the information provided is sufficient and credible per 18 AAC 70.016(c)(4) and identifies a new parameter, copper, in the Outfall 004A and Outfall 004B discharge as the only parameter that constitutes an expanded discharge based on loading or concentration limitations authorized in the 2013 Permit. Accordingly, copper in Outfalls 004A and 004B is the only parameter that requires Tier 2 Analysis.

6.5 Tier 2 Analysis

Per 18 AAC 70.015(a)(2), if the quality of water exceeds levels necessary to support propagation of fish, shellfish, wildlife, and recreation in and on the water (i.e., Tier 2 waters), that quality must be maintained and protected. The Department may allow a reduction of water quality only after finding that the most practicable and effective pollution prevention, control, and treatment methods are being used such that lowering of water quality is necessary.

6.5.1 Tier 2 Alternatives Analysis

Per 18 AAC 70.016(c)(4)(C-F), the applicant must submit a description and analysis of a range of practicable alternatives that have the potential to prevent or lessen the degradation associated with the new or expanded discharge. The analysis must identify the water quality environmental impacts, and relative costs for each practicable alternative. EMAP evaluated the following alternatives to eliminate or reduce the discharge of copper:

1. Treatment Systems Operation Optimization to Reduce Copper,
2. Discharge to Unnamed Freshwater Lake,
3. No Discharge by Backup UIC Well Construction,
4. No Discharge by Increased Infrastructure for Injection and Storage of Effluent,
5. Reduction in Copper by Installing Corrosion Inhibitor System,
6. Facility-wide Reduction in Copper by Replacement of Copper Piping and Fixtures, and
7. Marine Discharge by Relocating Outfalls to Lion Bay.

6.5.1.1 Optimization of Treatment Systems

The existing treatment systems were not designed to accommodate copper removal. There is inadequate footprint in the existing buildings to accommodate treatment

systems that could remove copper. To do so would not be practicable. As a first attempt to reduce copper to the point that effluent could meet water quality criteria and provide an incremental environmental benefit, EMAP performed modifications to operation, implemented preventative maintenance, and replaced critical treatment system components that were readily accessible. Specifically, EMAP replaced the existing UF membranes to attempt to remove more dissolved constituents, replaced easily accessible copper piping and fittings, cleaned out sumps and tanks, and flushed the MBR. While these actions improved copper removal slightly, the effect was unsuccessful in reducing copper to the point of meeting water quality criteria.

6.5.1.2 Discharge to Unnamed Freshwater Lake

If discharged to the unnamed freshwater lake, the driving parameter for the mixing zone would have been total dissolved solids (TDS) rather than copper. Similar to copper, there is no practicable alternative to upgrade the existing treatment systems for removal of TDS. In addition, the volume of the lake was determined to be insufficient over the long-term for providing adequate dilution for TDS. This alternative would have traded lowering of water quality from one dilution limited fresh waterbody to one with practically unlimited dilution in Lion Bay. Therefore, the alternative was rejected.

6.5.1.3 Backup UIC Well

As stated previously, the goal of EMAP is to maximize disposal of wastewater through injection into UIC wells. The PTOC currently has one UIC well for disposal and although optimization is being performed, there are times that discharging must be performed due to competition with oil production goals or well shut-in due to maintenance and repairs. During periods of well shut-in, there is no practicable transportation available to dispose of wastewater at another location or facility. Point Thomson operates seasonal ice roads but does not have year-long connectivity to gravel road systems, barge transport is also seasonal, and transport by air is logistically and financially impracticable. Hence, the no discharge option via transportation is not feasible and the cost of construction of a second injection well is estimated to be over $60 million.

6.5.1.4 Increased UIC Well Storage and Injection Rate

The infrastructure needed to increase injection rates or storage to improve injection abilities would require engineering design, offsite construction of modules, logistics of transporting the offsite modules (e.g., via sealift or ice road) as well as time to install and commission the upgrades would come at a high cost. These would cost more than $8 million, and would not alleviate the need for alternative disposal during periods the single well is shut-in. Compared to the selected alternative, the cost compared to the environmental benefit is disproportionate.

6.5.1.5 Corrosion Inhibitor

A corrosion inhibitor (e.g., orthophosphates) can decrease copper leaching from the source of copper pipes and fixtures by creating a film on the copper surfaces in contact with the corrosive water. Corrosion inhibitors are used typically to meet drinking water criteria for copper, 1,300 µg/L. Given the observed maximum concentration in the effluent is 78 mg/L, application of a corrosion inhibitor may not be adequate to lower

copper concentrations below the more restrictive marine water quality criteria, 3.1 to 4.8 mg/L. In addition, the formation of a film on surfaces can lead to increased potential for membrane fouling and cleaning requirements. Hence, a negative cross-media component exists with this alternative that must be considered. Although installation of a corrosion inhibitor system would only cost between $0.25 to $0.75 million, the environmental benefit may not be achieved and the risk of problems in the MBR treatment system overshadows the environmental benefit that could achieved.

6.5.1.6 Facility-wide Copper Pipe and Fixture Replacement

Copper piping are located throughout the camp in floors, ceilings, walls where replacement after the fact is not feasible and the actual replacement activity would cause enormous interruption of camp operation and decrease the overall design life of the facility to the invasive replacement activity. The cost was estimated to be more than $9 million. While a moderate environmental benefit could be realized, the impacts to the new facilities and workforce would be significant.

6.5.1.7 Relocating Outfalls to Lion Bay

Of the alternatives considered, construction a marine outfall to Lion Bay is the most practicable. The cost is expected to be between $1 to $3 million and can be constructed in a few months and there is adequate assurance that the alternative will meet the moderate environmental benefit it intends to provide. The outfall was designed based on the mixing zone modeling provided in the application; the chronic water quality criterion for copper will be met at the boundary of a 45 meter radii chronic mixing zone. Not only does this alternative resolve the concern over an injection well shut-in, it meets the objectives without creating complex new logistical concerns.

6.5.1.8 Department Alternative Analysis Conclusion

DEC concurs with the EMAP alternative analysis that lowering water quality cannot be completely mitigated with a "no discharge" scenario and given the remaining alternatives to discharge the construction of a marine outfall is the most practicable and reasonable alternative.

6.5.2 **Basis for Reduction of Water Quality**

Upon acceptance of the alternative analysis presented by the applicant, the Department can authorize a reduction in water quality only after the applicant has further submitted evidence in accordance with the following requirements under 18 AAC 70.015(a)(2):

(A) Allowing lower water quality is necessary to accommodate important economic or social development in the area where the water is located.

The Point Thomson facilities produce natural gas and liquid condensate from the Thomson Sand reservoir, recover and transport the condensate by pipeline for delivery to the TAPS, and re-injects the residual gas back into the reservoir. This APDES permit allows EMAP to operate the PTOC, an integral part of the overall Point Thomson oil and gas producing operations.

Continued operation of Point Thomson in turn "accommodates important economic and social development in the area where the water is located" pursuant to 18 AAC 70.015(a)(2)(A). Point Thomson supports the economy through contributions to State and North Slope Borough (NSB) taxes, State royalties, local employment, and education in the community.

Hydrocarbon production from fields such as Point Thomson is an important driver of economic and social development and a key revenue generator for the NSB and the State of Alaska. The Alaska Oil and Gas Association (AOGA) 2017 Economic Impact Study (AOGA Study) indicates Alaska received $1.6 billion in total oil and gas revenue in Fiscal Year 2016, through a variety of taxes, royalties, and other payments related to oil and gas development and production.

The AOGA Study also points out the economic impact for NSB residents through oil and gas-related taxes paid by the petroleum industry, including ExxonMobil. The oil and gas industry paid $347.5 million in property taxes to the NSB, or 96.7 % of total NSB tax revenues. These tax revenues in turn enable the NSB to support important social services to its residents in areas such as education, safety, health, and environmental protection. Over the past few years, operations at Point Thomson has contributed appreciable revenues to the NSB in terms of permitting fees, Service Area 10 (SA 10) services, and property taxes on the current property in place. ExxonMobil paid almost $40 million in property tax directly to the NSB in 2017. This amount includes 100% gross working interest share for ExxonMobil operated properties, but does not include taxes paid on properties, including Prudhoe Bay, Kuparuk and TAPS where ExxonMobil is not the operator.

Since the beginning of the Point Thomson Project, including the drilling program from 2009-2011, approximately $400 million in contracts have been awarded to North Slope Regional and Village Native Corporations, including partners and subsidiaries. In 2016, North Slope Village and Regional Native Corporations were primarily involved in the execution phases of these contracts, with a total spend of about $60 million to these groups. EMAP recognizes the value and importance of local hire and strives to recruit North Slope residents to work on Point Thomson development, including Kaktovik residents.

ExxonMobil has long been involved in improving educational opportunities, particularly in advancing science, technology, engineering, and mathematics (STEM) education. ExxonMobil supports a wide range of STEM initiatives targeting K-12 education, 2- and 4-year colleges technical skills training, and on-the-job training. ExxonMobil has established relationships with Ilisagvik College, the Harold Kaveolook School in Kaktovik, and the Alaska Native Science and Engineering Program (ANSEP) to assist with educational and skills development opportunities for North Slope residents.

Based on the above information, the Department determined that the permitted activities are necessary to accommodate important economic and social development, the anticipated lowering of water quality is necessary for these purposes, and that the finding is met.

(B) Except as allowed under this subsection, reducing water quality will not violate the applicable criteria of 18 AAC 70.020 or 18 AAC 70.235 or the whole effluent toxicity (WET) limit in 18 AAC 70.030.

18 AAC 70.020(b) specifies the State's protected water use classes, subclasses, and water quality criteria. The Permit places limits and conditions on the discharge of pollutants. The limits and conditions are established after comparing TBELs and WQBELs and applying the more stringent of these limits, or any other requirements from statutes or regulations that may be more stringent. The water quality criteria, upon which the WQBELs are based, serve the specific purpose of protecting the existing and designated uses of the receiving water. The Permit includes authorization of a semi-cylindrically shaped, 45 m radius, chronic mixing zone on the combined Outfall 004A and Outfall 004B based on copper being the driving parameter. All water quality criteria for all parameters evaluated in the effluent are met at, and beyond the boundary of this

chronic mixing zone. Accordingly, because the water quality criteria that ensures protection of existing uses are met and the analysis considered all use classes and subclasses, the existing uses of the waterbody as a whole are protected.

18 AAC 70.030(a) applies to WET limits and requires that an effluent discharged to a water may not impart chronic toxicity to aquatic organisms, expressed as 1.0 TU_c, at the point of discharge, or if the department authorizes a mixing zone in a permit at or beyond the mixing zone based on the minimum effluent dilution achieved in the mixing zone. There is currently no information that indicates that chronic WET would be a driving parameter for the mixing zone or would there reasonable potential to exceed the chronic WET criteria at the boundary of the chronic mixing zone derived based on copper being the driving parameter. The Department concludes that the copper limits in the Permit are sufficient to control chronic toxicity in the effluent. Hence, no chronic WET limit is imposed in the Permit and the requirements of 18 AAC 70.030(a) are met.

(C) The resulting water quality will be adequate to fully protect existing uses of the water.

As discussed in part (B) of the preceding Tier 1 analysis, marine waters are protected for all uses and this requirement is thus met at the boundary of the Outfall 004_{AB} mixing zone.

(D) All wastes and other substances discharged will be treated and controlled to achieve (i) for new and existing point sources, the highest statutory and regulatory requirements...

The applicable "highest statutory and regulatory treatment requirements" are defined in 18 AAC 70.015(d). The definition includes the four components noted below:

(1) Any federal technology-based effluent limitation identified in 40 C.F.R. 122.29 and 125.3, revised as of July 1, 2017 and adopted by reference;

Although EPA has developed national secondary treatment standards for POTWs, none exist for non-POTWs discharging domestic wastewater. In the absence of national standards, TBELs for these facilities are instead developed on a case-by-case basis using BPJ. Under 40 CFR 125.3(a), the TBELs for existing facilities must represent the minimum level of control that must be imposed in a permit and for existing facilities based on Best Practicable Control Technology Currently Available, Best Conventional Pollutant Technology, and Best Available Technology Economically Achievable and must consider appropriate for the class or category of the discharge and any unique factors related to the facility. The treatment using an MBR is a unique factor to be considered in the case-by-case development of TBELs using BPJ. The TBELs analysis presented in Appendix C documents the TBELs analysis for the Qiruk Camp and addresses this requirement for Outfall 004A. For Outfall 004B, there are also no ELGs for drinking water waste discharges but a TBEL is developed for TSS using case-by-case BPJ (See Appendix C).

(2) any minimum treatment standards identified in 18 AAC 72.050;

This part of the definition addresses the minimum treatment standards for domestic wastewater discharges. Per 18 AAC 72.050(a)(4), domestic wastewater discharges into the waters of the U.S. must have received secondary treatment prior to discharge. As described in earlier Section 2.2.1, the Outfall 004A WWTP is an MBR system meeting secondary treatment standards required under 18 AAC 72 (See Section 2.3.1.1). Therfore, this part of the definition is thus met.

(3) any treatment requirements imposed under another state law that is more stringent than a requirement of this chapter; and

This part of the definition includes any treatment required by state law that is more stringent than 18 AAC 70. Other regulations beyond 18 AAC 70 that may apply to this permitting action include 18 AAC 15, 18 AAC 72, and 18 AAC 83. The Permit is consistent with the minimum treatment requirements of 18 AAC 72 and 18 AAC 83 and neither the regulations in 18 AAC 15, nor any other state legal requirement that the Department is aware of, impose more stringent treatment requirements than 18 AAC 70. Therefore, this part of the definition is met.

(4) any water quality-based effluent limitations established in accordance with 33 U.S.C. 1311(b)(1)(C)(Clean Water Act, sec. 301(b)(1)(C).

Alaska marine water quality criteria are presented in the *Toxics Manual* and in 18 AAC 70.020 (amended through April 6, 2018). Both Outfalls 004A and 004B have WQBELs for copper based on demonstrating reasonable potential to exceed, or contribute to an exceedance, of marine water quality criteria for copper at the boundary of the acute and chronic mixing zone boundaries. No other water quality parameters (i.e., FC bacteria or zinc) demonstrated reasonable potential to necessitate a WQBEL. Therefore, this part of the definition is met.

In addition to the above analyses, DEC also researched available information to identify potential nonpoint sources of copper discharging, or otherwise impacting, the receiving waters of Lion Bay in conformance with 18 AAC 70.016(c)(7)(C)(i-iii).

There are no other point source discharges that would include copper in the vicinity of Lion Bay. Nonpoint sources could include minor amounts of copper in dust emissions from the gravel pad landing in the receiving water. DEC does not consider such inputs to be significant enough to have an impact on water quality in this remote location.

Per the documentation of the four parts, of the highest statutory and regulatory treatment requirements shown above, this finding is met.

7.0 OTHER PERMIT CONDITIONS

7.1 Quality Assurance Project Plan

The permittee is required to develop and implement a facility-specific QAPP that ensures all monitoring data associated with the Permit are accurate and to explain data anomalies if they occur. The permittee is required to develop and implement procedures in a QAPP that documents standard operating procedures the permittee must follow for collecting, handling, storing and shipping samples; laboratory analysis (e.g., most sensitive methods); and data reporting. Per Section 4.2.1.1 and 4.2.2.1, the QAPP must include methods of verifying adequate neutralization of CIP and NF cleaning waste prior to introducing into the MBR. If a QAPP has already been developed and implemented, the permittee must review and revise the existing QAPP to ensure it includes the necessary content. The permittee must submit a letter to the Department within 90 days of the effective date of the Permit certifying that the QAPP has been revised and implemented. The QAPP shall be retained onsite and made available to the Department upon request.

7.2 Operation and Maintenance Plan

The Permit requires the permittee to properly operate and maintain all facilities and systems of treatment and control. Proper operation and maintenance is essential to meeting discharge limitations, monitoring requirements, and all other permit requirements at all times. The permittee is required to develop or update and implement an operation and maintenance plan for its facility within 90 days of the effective date of the final Permit. If an Operation and Maintenance Plan has already been developed and implemented, the permittee need only to review the existing plan to make sure it is up to date and all necessary revisions are made. The plan shall be retained on site and made available to the Department upon request.

7.3 Best Management Practices Plan

A Best Management Practices Plan (BMP plan) presents operating and housekeeping measures intended to minimize or prevent the generation and potential release of pollutants from a facility to the waters of the U.S. during normal operations and additional activities. Per 18 AAC 83.475(4), "A permit must include best management practices to control or abate the discharge of pollutants when the practices are reasonably necessary to achieve effluent limitations and standards…"

Within 90 days of the effective date of the Permit, the permittee must review, revise as necessary, implement the BMP Plan to address current activities at the facility and submit written certification of the review, revision and implementation to DEC. Specifically, the BMP Plan must be updated to include CIP waste neutralization practices that ensure there is no discharge of CIP waste that has not been neutralized and routed to the WWTP MBR for treatment prior to discharging through Outfall 004_{AB}.

In each subsequent year of the Permit, the permittee must establish a committee to review and revise the BMP Plan as necessary to address any modifications or changes to operational practices and to continue to meet the objectives and specific requirements of the Permit. The permittee must submit written certification to DEC that the BMP Plan review committee has reviewed the BMP Plan, and modified if necessary, by January 31st of each year the Permit remains in effect.

7.3.1 Specific BMP Requirements

7.3.1.1 MBR CIP Neutralization BMPs

Per Section 4.2.1.1, the permittee must develop and implement BMPs specifically for adequate neutralization and verification of CIP wastewater prior to introducing into the MBR. For the purpose of this requirement, adequate neutralization is based on protecting the microbiology in the MBR.

7.3.1.2 NF Cleaning Waste Neutralization BMPs

Per Section 4.2.2.1, the permittee must develop and implement BMPs specifically for adequate neutralization and verification of NF cleaning waste prior to introducing into the MBR. For the purpose of this requirement, adequate neutralization is based on protecting the microbiology in the MBR.

7.4 Standard Conditions

Appendix A of the Permit contains standard regulatory language that must be included in all APDES permits. These requirements are based on the regulations and cannot be challenged in the context of an individual APDES permit action. The standard regulatory language covers requirements such as monitoring, recording, reporting requirements, compliance responsibilities, signatory authority, and other general requirements.

8.0 OTHER LEGAL REQUIREMENTS

8.1 Endangered Species Act

Per Section 7 of the Endangered Species Act (ESA), federal agencies are required to consult with the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) if their actions could beneficially or adversely affect any threatened or endangered species. As a state agency, DEC is not required to consult under Section 7 of the ESA regarding wastewater permitting actions. However, this does not absolve DEC from complying with Section 9 and 10 of the ESA. DEC voluntarily sent emails to both the FWS and NOAA on March 14, 2019 notifying the agency of current permit development activities and requesting critical habitat listings in the vicinity of Point Thomson. NMFS responded on March 20, 2019 by providing online resources for the self-verifying EFH and on April 4, 2019 indicating there is no critical habitat at PTOC and provided a list of endangered species that could be in the vicinity. The FWS responded on March 20, 2019 and NMFS on March 26, 2019. DEC used this communication to verify the information provided by EMAP in their application.

EMAP has conducted consultation with the services as part of the National Environmental Protection Act (NEPA) and as needed thereafter for various activities. Based on this history, the applicant submitted detailed information in their application regarding endangered species, critical habitat, and essential fish habitat (EFH) and habitat areas of particular concern (HAPCs). DEC verified this information from the NOAA Marine Mammal Species Range and Critical Habitat Interactive map located online at https://alaskafisheries.noaa.gov/esa-consultations. Similarly, DEC also accessed the FWS Information, Planning, and Conservation System website at https://ecos.fws.gov/ipac/location to verify information in the application. The following sections details the information in the application and verified by DEC.

8.1.1 FWS Identified Endangered Species

Based on information provided in the application and verified online by DEC, the vicinity of the discharge includes the potential for the following endangered species under the FWS purview:

- Spectacled eider
- Steller's eider, and
- Polar Bear.

Of these listed species, only the polar bear has been identified to have critical habitat in the vicinity of Point Thomson. Neither nesting nor post-nesting spectacled or Steller's eiders have been observed in the vicinity in recent years and neither have species were documented in an aerial survey conducted in 2011 (USACOE, 2012). Polar bears frequent the vicinity particularly in summer and early fall.

8.1.2 NMFS Identified Endangered Species

The blue whale and the bowhead whale are endangered species whose range extends to the vicinity of Point Thomson in the Beaufort Sea. The blue whale is also listed as a state endangered species. However, the vicinity of the discharge is in shallow water such that access to the discharge location is not likely and there is currently no critical habitat designations for either specie.

8.2 Essential Fish Habitat

EFH includes the waters and substrate (sediments, etc.) necessary for fish from commercially-fished species to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires federal agencies to consult with NOAA when a proposed discharge has the potential to adversely affect (reduce quality and/or quantity of) EFH. As a state agency, DEC is not required to consult with federal agencies regarding wastewater discharge permitting actions. However, DEC reviewed and verified information in the application to obtain listings of EFH near the subject discharge using the EFH Mapping Tool at https://www.habitat.noaa.gov/protection/efh/efhmapper/index.html.

The Arctic Ocean is identified as EFH for the following species:

- Snow Crab,
- Saffron Cod, and
- Arctic Cod.

Of these, the Arctic cod and snow crab were identified with NOAA's mapping tool to have EFH in the vicinity of Point Thomson. In addition, there are no HAPCs identified in the vicinity of the discharge.

8.3 Ocean Discharge Criteria Evaluation

CWA Section 403(a), Ocean Discharge Criteria, prohibits the issuance of a permit under CWA Section 402 for a discharge into the territorial sea, the water of the contiguous zone, or the oceans except in compliance with Section 403. Permits for discharges seaward of the baseline on the territorial seas must comply with the requirements of Section 403, which include development of an Ocean Discharge Criteria Evaluation (ODCE).

The Permit requires compliance with Alaska WQS. Consistent with 40 CFR 125.122(b), adopted by reference at 18 AAC 83.010(C)(8), discharges in compliance with Alaska WQS shall be presumed not to cause unreasonable degradation of the marine environment. EPA made the connection between the similar protections provided by ODCE requirements and WQS when promulgating ocean discharge criteria rules in 1980, as stated, "the similarity between the objectives and requirements of [state WQS] and those of CWA Section 403 warrants a presumption that discharges in compliance with these [standards] also satisfy CWA Section 403." (Ocean Discharge Criteria, 45 Federal Register 65943.). As such, given the Permit requires compliance with Alaska WQS, unreasonable degradation to the marine environment is not expected and further analysis under 40 CFR 125.122 is not warranted for this permitting action.

8.4 Permit Expiration

The Permit will expire five years from the effective date of the Permit.

9.0 REFERENCES

1. Alaska Department of Environmental Conservation, 2003. *Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances*, as amended through December 12, 2008.
2. Alaska Department of Environmental Conservation, 2010. *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report*
3. National Marine Fisheries Service (NMFS). *Email correspondence*. March 26, 2019.
4. U.S. Army Corp of Engineers (USACOE). Point Thomson EIS. July 2012
5. U.S. Environmental Protection Agency, 1987. *Model Permit Package for the Water Supply Industry*. Developed by SAIC through EPA Contract No. 68-01-7043.
6. U.S. Environmental Protection Agency. 1991. *Technical Support Document for Water Quality-based Toxics Control*. Office of Water Enforcement and Permits, Office of Water Regulations and Standards. Washington DC, March 1991. EPA/505/2-90-001.
7. U.S. Fish and Wildlife Service (FWS), Endangered Species Program, 2012. *Email correspondence*. March 20, 2019 and TBD.

Appendix A FIGURES

Figure 1: Point Thomson Site Location Map

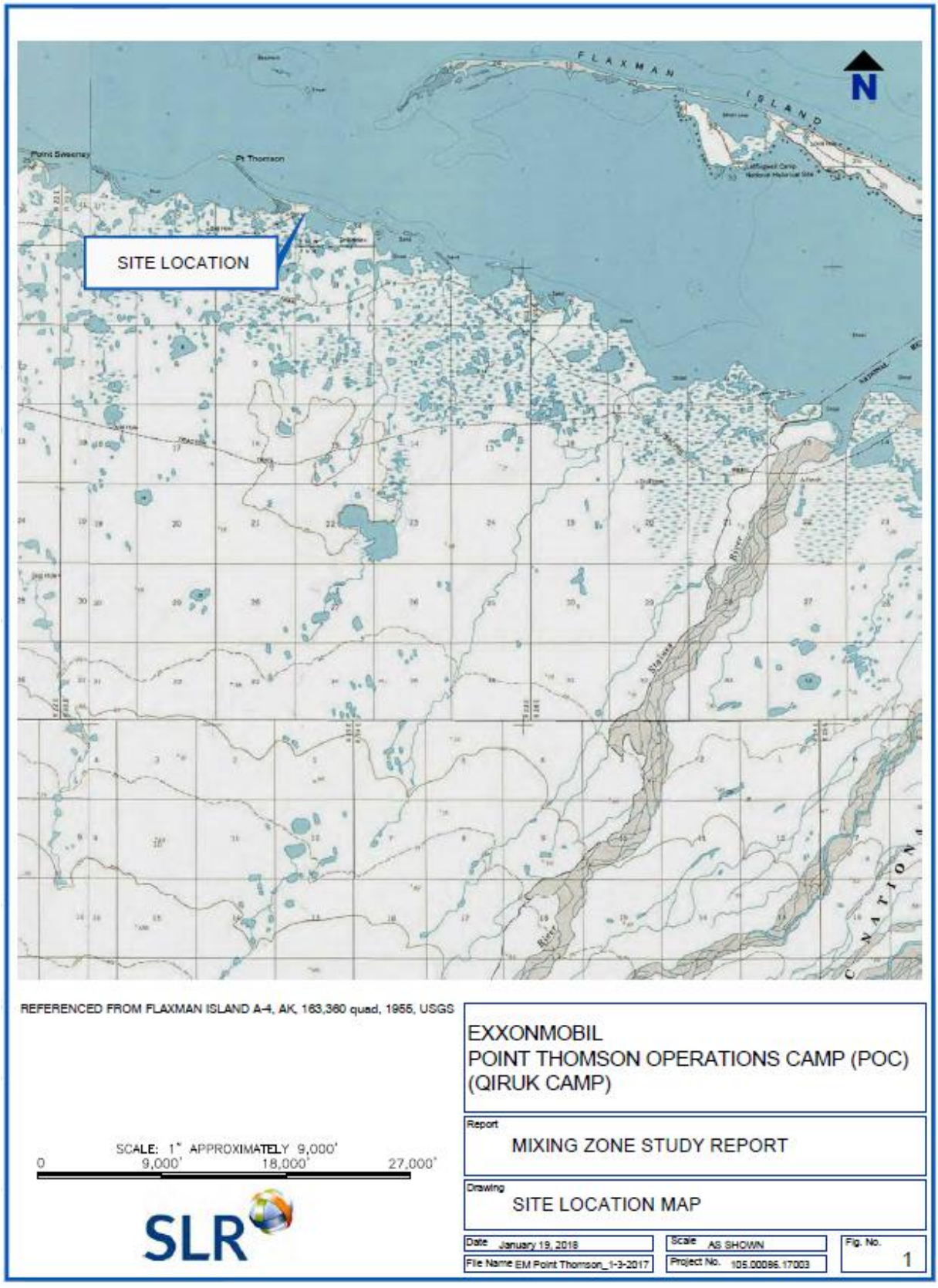


Figure 2: Point Thomson Vicinity Map

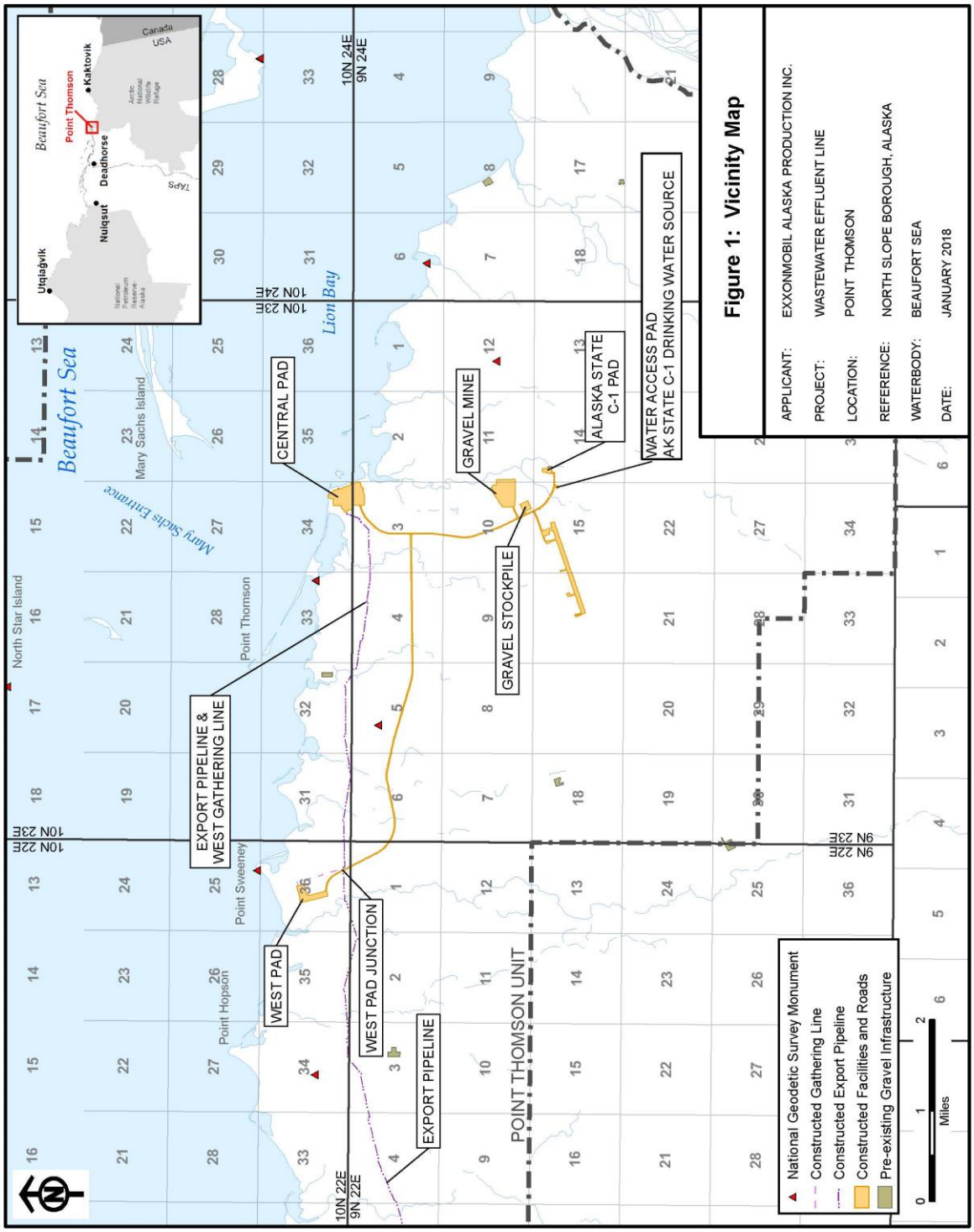


Figure 3: Central Pad Site Plan

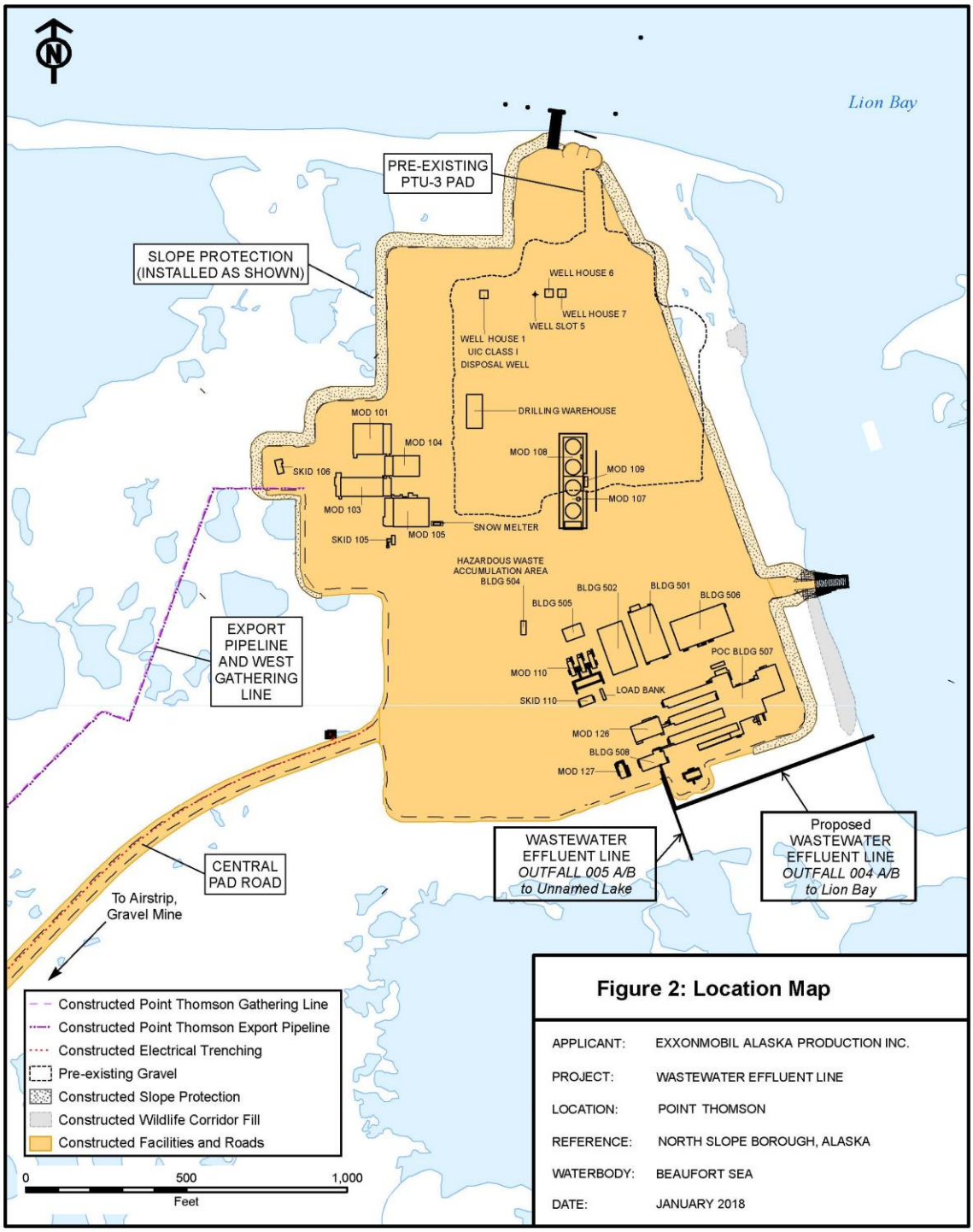


Figure 4: Point Thomson Central Pad Drainage

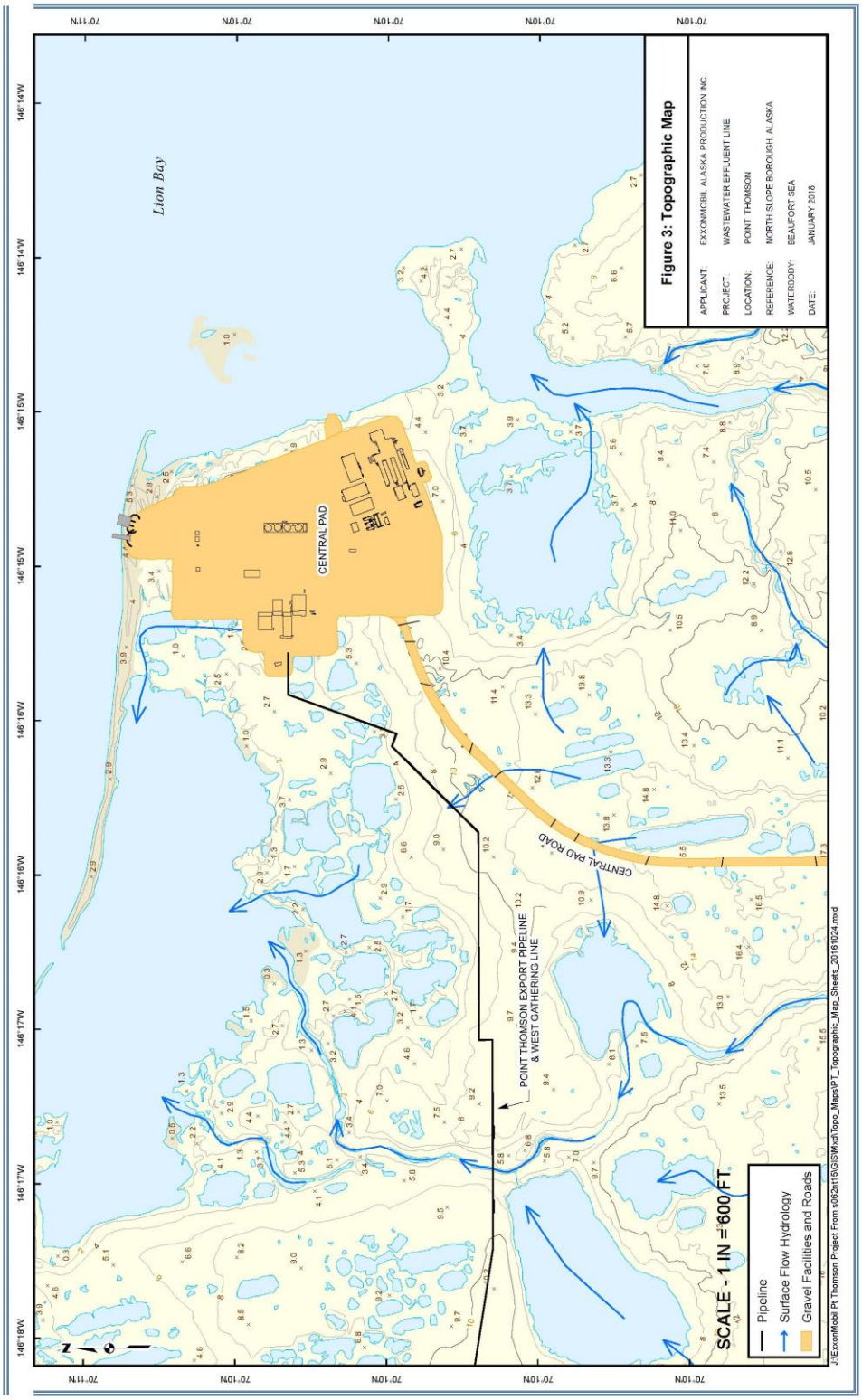


Figure 5: Qiruk Camp Wastewater Treatment Plant Schematic

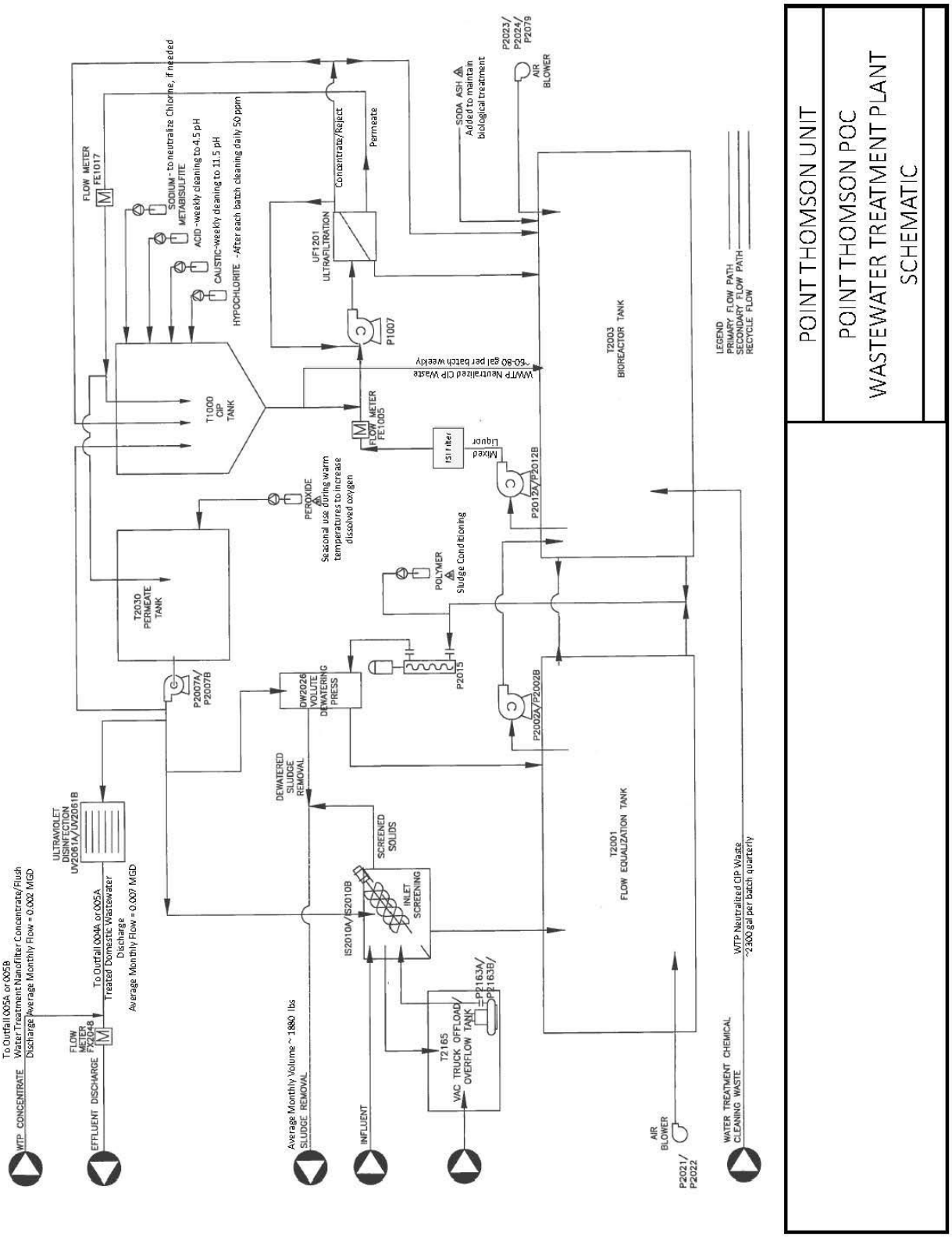
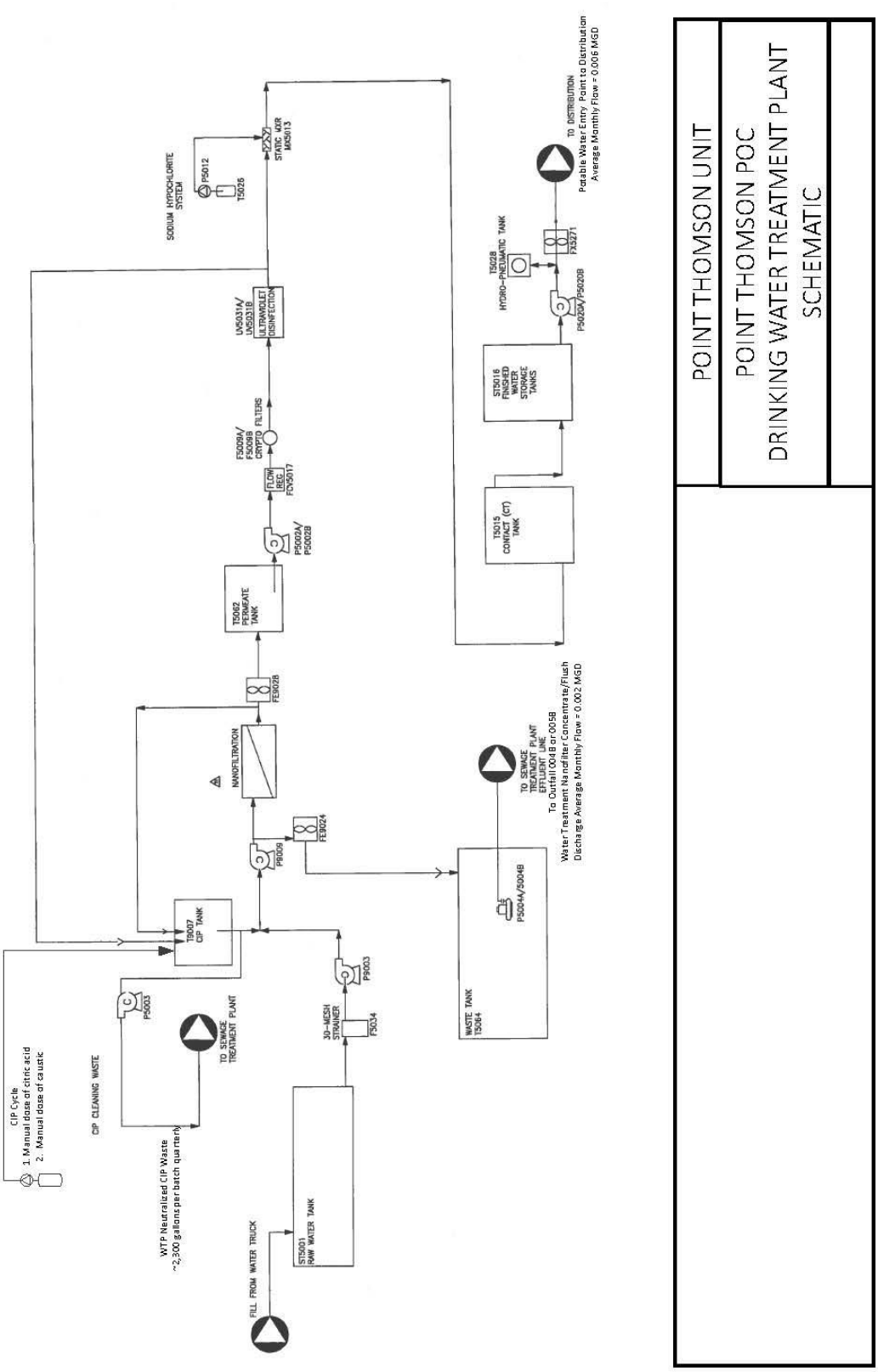


Figure 6: Qiruk Camp Water Treatment Plant Schematic



Appendix B REASONABLE POTENTIAL ANALYSIS

This Appendix summarizes the reasonable potential analysis (RPA) procedure used by the Alaska Department of Environmental Conservation (Department or DEC) to determine if development of water quality-based effluent limits (WQBELs) are necessary for individual permit AK0053694 – ExxonMobil Alaska Production (EMAP), Qiruk Camp (Permit).

Per Alaska Administrative Code (AAC) 18 AAC 83 - Alaska Pollutant Discharge Elimination System (APDES) Program, limits are required in APDES permits to achieve water quality standards established under 33 U.S.C. 1313, including state narrative criteria for water quality. Per 18 AAC 83.435(b), "Effluent limits in a permit must control all pollutants or pollutant parameters, either conventional, non-conventional, or toxic pollutants, that the department determines are or may be discharged at a level that will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard (i.e., criteria), including state narrative criteria for water quality." Alaska water quality criteria are established in 18 AAC 70 – Water Quality Standards and the *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances, 2008 (Toxics Manual).*

After screening parameters in Fact Sheet Section 2.3, DEC analyzes parameters of concern (POCs) in the discharge to determine if they will cause, or contribute to, an exceedance of water quality criteria per the RPA procedures described in the *APDES Reasonable Analysis and Effluent Limits Development Guide, June 30, 2014* (*RPA and WQBEL Guide*) and the associated spreadsheet tool. The *RPA and WQBEL Guide* and spreadsheet tool are based partly on procedures in the Environmental Protection Agency (EPA) *Technical Support Document for Water Quality-Based Toxics Control, 1991 (TSD)* that were modified by the Department.

The spreadsheet calculates the reasonable potential of a discharge of effluent containing a maximum expected concentration (MEC) of a parameter by comparing the projected receiving water concentration at the boundary of the authorized acute or chronic mixing zones to the applicable water quality criteria for that parameter. Reasonable potential exists if the projected receiving waterbody concentration (RWC) at the boundary of the respective mixing zone exceeds the applicable criteria for that parameter. If reasonable potential exists, a WQBEL must be included in the Permit per 18 AAC 83.435. The RPA procedures used by DEC are summarized in subsequent Appendix Sections B.1 and B.2 followed by example calculations specific to terminal wastewater discharges.

B.1 Mass Balance

For discharge of a parameter at the MEC into a marine receiving environment with a known ambient water concentration (AWC), the projected receiving waterbody concentration (RWC) is determined using a steady state model represented by the following mass balance equation:

$$(V_{MEC} + V_{AWC})RWC = V_{MEC}MEC + V_{AWC}AWC \qquad \text{(Equation B-1)}$$

where,

RWC = Receiving waterbody concentration downstream of the effluent discharge.

MEC = Maximum projected effluent concentration.

AWC = Ambient waterbody concentration, taken as the 85th percentile of data or 15 percent (%) of the chronic criteria if no ambient data is available. The AWC for copper was calculated based on 15 % of the chronic criteria.

V_{MEC} = Volume of the maximum expected effluent discharged into the control volume.

V_{AWC} = Volume of the ambient receiving water in the control volume.

The dilution factor for a discharge to meet water quality criteria at the boundary of a mixing zone is defined as:

Dilution Factor (DF), $DF = \frac{(V_{MEC}+V_{AWC})}{V_{MEC}}$ (Equation B-2)

Upon separating variables in Equation B-1, substituting Equation B-2, and rearranging yields:

$$DF = \frac{(MEC-AWC)}{(RWC-AWC)} \quad \text{(Equation B-3)}$$

Rearranging Equation B-3 to solve for RWC yields:

$$RWC = \frac{(MEC-AWC)}{DF} + AWC \quad \text{(Equation B-4)}$$

For known MEC and AWC, Equation B-3 can be used to determine the required DF for a constituent by substituting water quality criteria for RWC. For cases where a DF and mixing zone have been authorized, Equation B-4 is rearranged to calculate the RWC at the boundary of the mixing zone in the RPA.

B.2 Maximum Projected Effluent Concentration

The spreadsheet tool calculates the MEC by applying a reasonable potential multiplier (RPM) based on a 99th percentile at a 95th confidence interval to the maximum observed concentration (MOC) for a parameter. In addition, DEC evaluates the distribution of the data set using EPA's *ProUCL Statistical Software Program, Version 4.1* rather than assuming a lognormal distribution as described in parts of the TSD in calculating the coefficient of variation (CV). The possible statistical distributions include normal, lognormal, gamma, or non-parametric.

The RPM is calculated differently depending on the type of distribution, CV of the data, and the number of data points. When fewer than 10 valid data points are available, the TSD recommends using the assumption that the distribution is lognormal and the CV is equal to 0.6, a conservative estimate that assumes a relatively high variability.

For data sets with 10 or more valid data points CV is generally defined as the ratio of the sample standard deviation of the data set to the sample mean.

$$CV = coefficient\ of\ variation = \frac{standard\ deviation}{mean},$$

For data sets with a normal or gamma distribution or analyzed with the nonparametric method (Kaplan-Meier):

$$CV = \frac{\hat{\sigma}_y}{\hat{\mu}_y} \quad \text{(Equation B-5)}$$

Where: $\hat{\mu}_y = estimated\ mean = \frac{\sum[x_i]}{k}, 1 \le i \le k$

$\hat{\sigma}_y{}^2 = estimated\ variance = \sum \frac{[(x_i-\mu)^2]}{k-1}, 1 \le i \le k$

$\hat{\sigma}_y = estimated\ standard\ deviation = (\sigma^2)^{0.5}$

$$k = number\ of\ samples$$

For data sets with a Lognormal or Log-ROS distribution:

$$CV = [\exp(\hat{\sigma}_y^2) - 1]^{0.5} \quad \text{(Equation B-6)}$$

Where: $y_i = \ln(x_i)\ for\ i = 1,2, \dots, k$

$$\hat{\mu}_y = mean = \sum(y_i)/k$$

$$\hat{\sigma}_y^2 = variance = \sum[(y_i - \hat{\mu}_y)^2]/(k-1)$$

$$k = number\ of\ samples$$

The RPM is the ratio of the upper bound of the distribution at the 99th percentile to the percentile represented by the MOC, at the 95 % confidence level. The lognormal equations B-8 and B-9 are used as the input into Equation B-7 for lognormal distributions:

$$RPM = \frac{C_{99}}{C_{Pn}} \quad \text{(Equation B-7)}$$

$$C_{99} = \exp[(Z_{99} * \hat{\sigma}_y) - (0.5 * \hat{\sigma}_y^2)] \quad \text{(Equation B-8)}$$

$$C_{Pn} = \exp[(Z_{Pn} * \hat{\sigma}_y) - (0.5 * \hat{\sigma}_y^2)] \quad \text{(Equation B-9)}$$

In the case when data are normal, gamma, or display no discernable distribution, Equations B-10 and B-11 are used as input into Equation B-7:

$$C_{99} = \hat{\mu}_n + Z_{99} * \hat{\sigma} \quad \text{(Equation B-10)}$$

$$C_{Pn} = \hat{\mu}_n + Z_{Pn} * \hat{\sigma} \quad \text{(Equation B-11)}$$

In all Equations B-9, B-11, and B-13, the percentile represented by the MOC is:

$$p_n = (1 - confidence\ level)^{1/n} \quad \text{(Equation B-12)}$$

Where:

$$p_n = the\ percentile\ represented\ by\ the\ MOC$$

$$n = the\ number\ of\ samples$$

$$Confidence\ Level = 0.95\ for\ this\ analysis$$

In the event that the calculated RPM is less than one (1), the RPM value defaults to a value of one (1) per *RPA and WQBEL Guide*. The MEC is determined by multiplying the MOC by the RPM to derive the MEC:

$$MEC = (RPM) * (MOC) \quad \text{(Equation B-13)}$$

Either the acute or chronic RWC at the boundary of an authorized mixing can be determined using the MEC in Equation B-4.The receiving water concentrations at the boundary of the mixing zones are then calculated as follows:

$$\mathrm{RWC_{a,c}} = \frac{\mathrm{MEC} - \mathrm{AWC}}{\mathrm{DF_{a,c}}} + \mathrm{AWC} \qquad \text{(Equation B-14)}$$

Where:

RWC $_{a,c}$ = receiving water concentration at the boundary of the acute or chronic mixing zone,
AWC $_{a,c}$ = applicable water quality criteria, and
$DF_{a,c}$ = the authorized acute or chronic dilution factor.

If the RWC at either the acute or chronic mixing zone boundary is found to be greater than the respective criteria for the constituent, then reasonable potential is determined for that parameter and a WQBEL must be developed for that parameter.

B.3 Example Calculations for Outfall 004$_{AB}$ for Copper

This section summarizes the analysis of the copper in the Outfall 004$_{AB}$ discharge as an example of the RPA calculation process. Outfall 004$_{AB}$ refers to the combine discharges of Outfall 004A and Outfall 004B characterized in Fact Sheet Section 2.3.3 as having a maximum observed flow-weighted total recoverable concentration $MOC_{\overline{AB}}$. The flow-weighting calculation uses mass-balance in the following equation:

$$(Q_A + Q_B)MOC_{\overline{AB}} = Q_A MOC_A + Q_B MOC_B \qquad \text{(Equation B-15)}$$

Characterization of combined Outfall 004$_{AB}$ in Fact Sheet Section 2.3.3identified the copper as parameter that would have reasonable potential and require WQBELs based on dissolved metal data and criteria. However, the *RPA and WQBEL Guide* uses total recoverable concentrations for metals. Therefore, the dissolved concentrations have been converted to total recoverable concentrations by applying the metal translators in 18 AAC 70, Appendix B.

In order to proceed with the RPA to confirm this assertion, the flow-weighted $MEC_{\overline{AB}}$ must be determined by rearranging Equation B-15 and substituting the individual MECA and MECB, 94 µg/L and 3.25 µg/L respectively, with the instantaneous flow rates of QA and QB, 35 gallons per minute (gpm) and 25 gpm respectively. Based on these substituted values, the $MOC_{\overline{AB}}$ is 56.2 µg/L. Example reasonable potential calculations for copper using the $MOC_{\overline{AB}}$ are summarized below.

Calculate RPM:

The characterization information for total copper included 7 data points. Because the data set is less than 10, a lognormal distribution and a CV of 0.6 is assumed.

Accordingly, the RPM was calculated with the following inputs:

Z_{99} = 2.326
CV = 0.6
$\hat{\sigma}$ = $\ln[CV^2 + 1]^{1/2}$ = 0.5545 µg/L
n = 7
$p_7 = (1 - 0.95)^{(1/7)} = 0.6518$
Z_{P7} = 0.390 (calculated using spreadsheet equation "normsinv(p_n)"

RPM = [exp (2.326 x 0.5545 - 0.5 x 0.5545^2)] / [exp (0.39 x 0.5545 - 0.5 x 0.5545^2)]

= 2.925

Calculate $MEC_{\overline{AB}}$ per equation B-13 using the following inputs:

$MEC_{\overline{AB}}$ = RPM x $MOC_{\overline{AB}}$

RPM = 2.925

MOC = 56.2 µg/L

$MEC_{\overline{AB}}$ = 2.925 x 56.2µg/L = 164.4 µg/L,

Calculate required acute and chronic DFs per equation B-3

$$\mathrm{DFa,c} = \frac{(MEC_{\overline{AB}} - \mathrm{AWC})}{(\mathrm{RWC} - \mathrm{AWC})}$$

RWC = 0.56 µg/L based on 15 % of chronic criteria adjusted for total copper

AWC_a = 5.78 µg/L based on acute water quality criteria adjusted for total copper

AWC_c = 3.7 µg/L based on chronic water quality criteria adjusted for total copper

DF_a = (164.4 µg/L – 0.56 µg/L)/(5.78 µg/L – 0.56 µg/L)

= 31.4 required (DEC authorizes 31)

DF_c = (164.4 µg/L – 0.56 µg/L)/(3.7 µg/L – 0.56 µg/L)

= 51.8 required (DEC authorizes 51.5)

Calculate acute and chronic RWC using the authorized $DF_{a,c}$ per equation B-14

$$RWC_{a,c} = \frac{(MEC_{\overline{AB}} - AWC)}{DF_{a,c}} + AWC$$

$$\mathrm{RWC_a} = \frac{164.4\ \mathrm{ug/L} - 0.56\ \mathrm{ug/L}}{51.5} + 0.56\ \mathrm{ug/L} = 5.84\ \mu\mathrm{g/L}$$

$$\mathrm{RWC_c} = \frac{164.4\ \mathrm{ug/L} - 0.56\ \mathrm{ug/L}}{31} + 0.56\ \mathrm{ug/L} = 3.74\ \mu\mathrm{g/L}$$

In order to determine if reasonable potential exists for the discharge to violate ambient criteria, the highest projected concentrations at the boundaries of the acute and chronic the mixing zones are compared with their ambient criteria.

As shown in the comparison below, total copper has reasonable potential to violate applicable ambient criteria at the boundaries of both the acute and chronic mixing zones.

Acute 5.84 µg/L > 5.78 µg/L (acute criteria) **YES**, there is a reasonable potential to exceed

Chronic: 3.74 µg/L > 3.7 µg/L (chronic criteria) **YES**, there is a reasonable potential to exceed

Since there is a reasonable potential for the effluent to cause, or contribute to, an exceedance of acute and chronic water quality criteria for protection of aquatic life, a WQBEL for total copper is required. See Appendix C for development of this limit.

Appendix C BASIS FOR EFFLUENT LIMITATIONS

Per Alaska Administrative Code (AAC) 18 AAC 83.015, the Alaska Department of Environmental Conservation (Department or DEC) prohibits the discharge of pollutants to waters of the United States (U.S.) without first obtaining a permit issued by the Alaska Pollutant Discharge Elimination System (APDES) Program that meets the purposes of Alaska Statutes (AS) 46.03 and is in accordance with Clean Water Act (CWA) Section 402. Per these statutory and regulatory requirements, Individual Permit AK0023248 – ExxonMobil Alaska Production (EMAP), Qiruk Camp (Permit) includes effluent limitations that require the discharger to (1) meet standards reflecting levels of technological capability, (2) comply with 18 AAC 70 – Alaska Water Quality Standards (WQS), and (3) comply with other state requirements that may be more stringent.

The CWA requires that the limits for each pollutant discharge parameter be the more stringent of either technology-based effluent limits (TBELs) or water quality-based effluent limits (WQBELs). TBELs are set via rule makings by the Environmental Protection Agency (EPA) in the form of Effluent Limitation Guidelines (ELGs) that correspond to the level of treatment that is achievable for a given industry using available technology. In situations where ELGs have not been developed, or have not considered specific discharges or pollutants, a regulatory agency can develop TBELs using best professional judgment (BPJ) on a case-by-case basis. A WQBEL is designed to ensure that WQS are maintained and the waterbody as a whole is protected. In cases where both TBELs and WQBELs have been generated for a particular parameter, the more stringent of the two limits will be selected as the final Permit limit for the parameter.

C.1 TECHNOLOGY BASED EFFLUENT LIMITS (TBELs)

C.1.1 TBELs based on ELGs

ELGs are TBELs developed by the EPA on an industry-by-industry basis and are intended to represent the greatest pollutant reductions that are technologically and economically achievable for a given industry. Per 18 AAC 83.430(a)(1), an APDES permit must include conditions meeting the requirements of applicable TBELs if they have been developed for the type of discharge authorized by the Permit. There currently are no ELGs applicable to discharges from the Qiruk Camp.

C.1.2 TBELs based on Case-by-Case Best Professional Judgement

C.1.2.1 Outfall 004A – Domestic Wastewater Treatment Plant (WWTP): The 2013 Permit included TBELs for domestic wastewater using case-by-case BPJ based on meeting the requirements of Chapter 40, Code of Federal Regulations, Part 133.102 (40 CFR 133.102) for Publically-Owned Treatment Works (POTWs). The statement of basis in the 2013 was:

> "While secondary requirements only directly apply to POTWs, the Department is applying secondary treatment standards to privately-owned treatment facilities as they are identical to POTWs in mechanics and treatment efficacy, and accordingly, the secondary standards provide the most meaningful baseline pollutant control guidelines for this sector of privately-owned treatment facilities."

Per Fact Sheet Section 2.3.1.1, the basis stated in the 2013 Fact Sheet is true except for application of the 85 percent (%) removal requirements for five-day biochemical

oxygen demand (BOD_5) and total suspended solids (TSS). The performance of the membrane bioreactor (MBR) at the WWTP as demonstrated by the characterization data in the Fact Sheet is superior to the types of POTWs for which the removal limitation was developed. The performance of the MBR for BOD_5 and TSS removal is greater than 98 %. Hence, the 85 % removal requirement is not necessary to control effluent in this type of treatment system. Therefore, DEC is acknowledging this previous technical mistake and adopting a new basis for secondary treatment using the definition of secondary treatment in 18 AAC 72.990(59). The secondary requirements found in 18 AAC 72 are consistent with 40 CFR 133.102 except there is no % removal requirements in 18 AAC 72. DEC is developing TBELs using case-by-case BPJ citing the minimum treatment requirements per 18 AAC 72.050 as secondary treatment defined in 18 AAC 72.990(59). These state regulations specify maximum daily limits (MDLs) and average monthly limits (AMLs) for BOD_5 and TSS and a range of pH between 6.0 and 9.0 standard units (su) at all times. The 2013 Permit also included mass-based and average weekly limits for BOD_5 and TSS. The Department is retaining the TBELs using case-by-case BPJ for pH and the concentration based MDL of 60 milligrams per liter (mg/L) and AML of 30 mg/L for BOD_5 and TSS. Although included in the definition of secondary treatment, the Department is not applying the average weekly limit of 45 mg/L in the definition because the MDL and AML are sufficient to control these pollutants in the discharge. Similarly, the mass-based MDL and AML for BOD_5 and TSS are not necessary to control these parameters in the effluent and are not retained in the Permit (See Fact Sheet Section 2.3.1.1).

C.1.2.2 Outfall 004B – Nanofiltration (NF) Concentrate/Flush

The 2013 Permit included TBELs developed using case-by-case BPJ citing various studies and National Pollutant Discharge Elimination System permits from other states. The adopted TBELs include an MDL of 60 mg/L and an AML of 30 mg/L for TSS. As part of reissuing the Permit, DEC has reviewed this previous evaluation and recent characterization data from the discharge and concurs with the previous adoption of these limits (See Fact Sheet Section 2.3.2.1). These TBELs limits are being retained in the Permit.

C.2 WATER QUALITY BASED EFFLUENT LIMITS

C.2.1 Statutory and Regulatory Basis

Per 18 AAC 70.010, a person may not conduct an operation that causes, or contributes to, a violation of the Alaska WQS. Per 18 AAC 83.435(a), an APDES permit must include conditions to meet any applicable requirement in addition to or more stringent than promulgated ELGs or standards. When evaluating if WQBELs are needed in addition to TBELs, DEC conducts a reasonable potential analysis (RPA) on the parameters of concern (POCs) which were identified during the effluent characterization process (See Fact Sheet Section 2.3). POCs are effluent parameters DEC considers to have a possibility to exceed, or contribute to an exceedance of, water quality criteria at the point of discharge or at the boundary of a mixing zone, if authorized. If a mixing zone is authorized, the authority must consider the dilution available in the authorized mixing zone in the RPA. Per 18 AAC 83.435(c), DEC must also use procedures that account for effluent variability (e.g., maximum expected concentrations and coefficient of variation), existing controls on point source (e.g., treatment systems) and nonpoint sources of pollution (e.g., ambient receiving water concentrations).

C.2.2 Reasonable Potential Analysis

The Department developed and implemented a *Reasonable Potential Analysis and Effluent Limits Development Guide, June 30, 2014 (RPA and WQBEL Guide)* and associated spreadsheet tool that were used in development of the WQBELs in the Permit. The RPA procedure calculates maximum effluent concentrations (MECs) based on the 99th percentile at a 95 % confidence interval and projects the receiving water concentrations at the boundary of the mixing zones using mass balance to determine whether concentrations of POCs exceed, or contribute to exceedance(s), of water quality criteria at the mixing zone boundaries. The applicable water quality criteria is provided by WQS or the *Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances, 2008* (*Toxics Manual*).

C.2.2.1 Outfall 004$_{AB}$ (004A and 004B Combined) RPA Results

Based on the results of the effluent characterization, DEC conducted an RPA for Outfall 004$_{AB}$, a combination of Outfall 004A and 004B. Copper was the only parameter having reasonable potential to exceed criteria at the acute and chronic mixing zone boundaries (see Appendix B). Accordingly, the Permit will include a WQBEL for total recoverable copper in the Outfall 004A and Outfall 004B discharges.

C.2.3 Wasteload Allocations

In the context of this section, a wasteload allocation (WLA) is the concentration of a pollutant that can be discharged to the receiving water and comply with the acute (a) or chronic (c) water quality criteria ($WQC_{a,c}$) when accounting for ambient receiving water concentrations (AWC) and authorized acute or chronic dilution factors ($DF_{a,c}$) in the mixing zones, if applicable. The WLA in this instance is based on two discharges combined that resulted in an overall mixing zone derived based on mass-balance, a flow-weighted approach to allocating assimilative capacity in the receiving water. The mass-balance approach used to size the mixing zone must be considered when apportioning WQBELs among the two combined outfalls in the derivation.

For discharges where information on ambient receiving water concentrations is not available, DEC's practice is to calculate the ambient concentration (Amb) as 15 % of the most stringent applicable water quality criteria. Because water quality criteria for metals are provided as dissolved and limits are required to be reported as total recoverable, dissolved concentrations are converted to total recoverable using metals translators in *Toxics Manual, Appendix B – Conversion Factors for Saltwater Dissolved Metals Criteria*. The WLA is calculated by rearranging Equation B-3 in *Appendix B* and substituting WQC for receiving water concentration and WLA for the maximum expected concentration. The resulting mass balance equation is:

$$WLA_{a,c} = DF_{a,c}(WQC_{a,c} - Amb) + Amb \qquad \text{(Equation C-1)}$$

C.2.3.1 Outfall 004$_{AB}$ WLA for Copper

For copper in the combined Outfall 004$_{AB}$, the inputs for the WLA equation are shown below:

- $DF_a = 31$
- $DF_c = 51.5$
- $WQC_a = 5.783$ µg/L total concentration
- $WQC_c = 3.735$ µg/L total concentration
- Amb = 0.56 µg/L based on 15 % of WQC_c

Inputting the above values into the WLA equation results in the following WLAs for copper for the Outfall 004_{AB} mixing zones:

WLA_a = 162.4 µg/L

WLA_c = 164.0 µg/L

C.2.3.2 Long-Term Averages (LTAs)

LTA_a and LTA_c concentrations are calculated from the acute and chronic WLAs using the following equations:

$$LTA_a = WLA_a * e^{(0.5\sigma^2 - z\sigma)} \quad \text{(Equation C-2)}$$

where,

$\sigma^2 = \ln(CV^2 + 1)$

z = 2.326 for 99th percentile probability basis

$$CV = coefficient\ of\ variation = \frac{standard\ deviation}{mean}$$

$$LTA_c = WLA_c * e^{(0.5\sigma^2 - z\sigma)} \quad \text{(Equation C-3)}$$

where,

$$\sigma^2 = \ln\left(\frac{CV^2}{4} + 1\right)$$

z = 2.326 for 99th percentile probability basis

$$CV = coefficitent\ of\ variation = \frac{standard\ deviation}{mean}$$

C.2.3.2.1 Outfall 004_{AB} LTAs and End of Pipe Limits for Copper

Calculations

Determine Long Term Averages (LTAs)

The LTAs acute (a) and chronic (c) exposure were calculated as follows:

$LTA_a = WLA\ [\exp(0.5\sigma^2 - Z_{99}\sigma)]$, where $\sigma^2 = \ln(CV^2 + 1)$

WLA_a = 162.4 µg/L, CV = 0.6, Z_{99} = 2.326, and $\sigma^2 = 0.3075$

LTA_a = 52.1 µg/L

$LTA_c = WLA_c\ [\exp(0.5\sigma_4^2 - Z_{99}\sigma_4)]$, where $\sigma_4^2 = \ln(CV^2/4 + 1)$

WLA_c = 164.0 µg/l, CV = 0.6, Z_{99} = 2.326, and $\sigma_4^2 = 0.0862$

LTA_c = 86.5 µg/L

Determine the most limiting (lowest) LTA

LTA_a is most limiting = 52.1 µg/L

C.2.3.2.2` Calculate MDL and AML for the Combined Discharge of 004_{AB}

$MDL_{AB} = LTA_a\ [\exp(Z_{99}\sigma - 0.5\sigma^2)]$, where $\sigma^2 = \ln(CV^2 + 1)$ (Equation C-5)

$CV = 0.6$, $Z_{99} = 2.326$, and $\sigma^2 = 0.3075$

MDL_{AB} = 162.4 µg/L

$AML_{AB} = LTA_a\ [\exp(Z_{95}\sigma_4 - 0.5\sigma_4^2)]$, where $\sigma_4^2 = \ln(CV^2/4 + 1)$, (Equation C-6)

$CV = 1.1$, $Z_{95} = 1.645$, and $\sigma_4^2 = 0.0862$

AML_{AB} = 80.95 µg/L

C.2.3.2.3 Apportioning Limits to 004A and 004B to Satisfy Combined WLA_{AB}

The limits calculated in C.2.3.2.2 assume that both 004A and 004B discharge simultaneously. This is rarely the case. Therefore, it is appropriate to apportion the limits in a manner that satisfies the overall WLA_{AB}. To do this, the same mass-balance approach that determined the maximum observed concentration of the combined discharge must be applied in reverse fashion using the MDL_{AB} and the AML_{AB} as the concentration. Conceptually, the portion of the overall mixing zone volumes for each outfall is additive in determining the combined mixing zone volume in the authorized mixing zone. Therefore, the same ratio of the MOC_A (78 µg/L) to the MOC_B (2.7 µg/L) for copper in Fact Sheet Section 2.3.3 can be applied to the MDL_A and MDL_B. Hence, $MOC_A = 28.88MOC_B$ and, by corollary, $MDL_A = 28.88MDL_B$. Substituting these values into a mass balance equation for WQBEL MDL_{AB} and AML_{AB} results in:

$$(Q_A + Q_B)MDL_{\overline{AB}} = 28.88Q_A MDL_A + Q_B MDL_B \quad \text{(Equation C-7)}$$

$$(Q_A + Q_B)AML_{\overline{AB}} = 28.88Q_A AML_A + Q_B AML_B \quad \text{(Equation C-8)}$$

Solving Equation C-7 first for MDL_B and then MDL_A yields:

MDL_B = 9.4 µg/L (**Use 9.5 µg/L**) and MDL_A = 271.4 µg/L (**Use 270 µg/L**)

Solving Equation C-8 in the same manner yields:

AML_B = 4.69 µg/L (**Use 4.7 µg/L**) and AML_A = 135.42 µg/L (**Use 135 µg/L**)

Note that these limits satisfy the WLA_{AB}; the resulting wasteload applicable to the limits is 161.4 µg/L which is less than the maximum WLA_{AB} of 262.4 µg/L. Also note that because the volumes of the mixing zone allocations are additive, the resulting limits shown above would be the same as if each discharge was authorized a separate mixing zone allocating the same respective volume in the receiving water.

C.2.4 Other Applicable Numeric and Narrative WQBELs

C.2.4.1 pH Criteria

Ph: The criteria for pH is no less than 6.5 su and not greater than 8.5 SU. During the term of the 2013 Permit, the permittee has been able to comply with the more stringent WQBEL for pH on both outfalls. Therefore, DEC is retaining these limits in the Permit as being more stringent than TBELs.

C.2.4.2 Narrative Requirement WQBELs

Residues: Residues include floating solids, debris, sludge, deposits, foam, or other objectionable conditions. Per 18 AAC 70.020(b)(20)(A)(ii), a discharge "may not, alone or in combination with other substances, cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines; cause leaching of toxic or deleterious substances; or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines." Residues will be applied as a standard narrative permit condition in the Permit.

Appendix D Mixing Zone Analysis Checklist

Mixing Zone Authorization Checklist

Based on Alaska Water Quality Standards (2003)

The purpose of the Mixing Zone Checklist is to guide the permit writer through the mixing zone regulatory requirements to determine if all the mixing zone criteria presented in the Alaska Administrative Code (AAC) at 18 AAC 70.240 through 18 AAC 70.270 are satisfied, as well as provide justification to authorize a mixing zone in an Alaska Pollution Discharge Elimination System permit. In order to authorize a mixing zone, all criteria must be met. The permit writer must document all conclusions in the permit Fact Sheet. However, if the permit writer determines that one criterion cannot be met, then a mixing zone is prohibited, and the permit writer need not include in the Fact Sheet the conclusions for when other criteria were met.

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
Size	Is the mixing zone as small as practicable? - Applicant collects and submits water quality ambient data for the discharge and receiving waterbody (e.g. flow and flushing rates)	Yes •Technical Support Document for Water Quality Based Toxics Control •Water Quality Standards Handbook • DEC's RPA Guidance • EPA Permit Writers' Manual Fact Sheet Section 3.3.1	18 AAC 70.240 (a)(2) 18 AAC 70.245 (b)(1) - (b)(7) 18 AAC 70.255(e) (3) 18 AAC 70.255 (d)	Y

Technology	Were the most effective technological and economical methods used to disperse, treat, remove, and reduce pollutants? **If yes**, describe methods used in Fact Sheet. Mixing Zone Analysis. Attach additional documents if necessary.	Yes Fact Sheet Section 3.3.2	18 AAC 70.240 (a)(3)	Y
Low Flow Design	**For river, streams, and other flowing fresh waters.** - Determine low flow calculations or documentation for the applicable parameters. Justify in Fact Sheet	N/A – Marine Discharge	18 AAC 70.255(f)	
Existing use	Does the mixing zone…			
	(1) partially or completely eliminate an existing use of the waterbody outside the mixing zone? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.3	18 AAC 70.245(a)(1)	Y
	(2) impair overall biological integrity of the waterbody? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.3	18 AAC 70.245(a)(2)	Y
	(3) provide for adequate flushing of the waterbody to ensure full protection of uses of the waterbody outside the proposed mixing zone? **If no, then mixing zone prohibited.**	Yes Fact Sheet Section 3.3.3	18 AAC 70.250(a)(3)	Y
	(4) cause an environmental effect or damage to the ecosystem that the Department considers to be so adverse that a mixing zone is not appropriate? **If yes, then mixing zone prohibited.**	No Fact Sheet Section 3.3.3	18 AAC 70.250(a)(4)	Y

Human consumption	Does the mixing zone…			
	(1) produce objectionable color, taste, or odor in aquatic resources harvested for human consumption? **If yes, mixing zone may be reduced in size or prohibited.**	No Fact Sheet Section 3.3.4	18 AAC 70.250(b)(2)	Y
	(2) preclude or limit established processing activities of commercial, sport, personal use, or subsistence shellfish harvesting? **If yes, mixing zone may be reduced in size or prohibited.**	No Fact Sheet Section 3.3.4	18 AAC 70.250(b)(3)	Y
Spawning Areas	Does the mixing zone…			
	(1) discharge in a spawning area for anadromous fish or Arctic grayling, northern pike, rainbow trout, lake trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.5	18 AAC 70.255 (h)	Y
Human Health	Does the mixing zone…			
	(1) contain bioaccumulating, bioconcentrating, or persistent chemical above natural or significantly adverse levels? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.6	18 AAC 70.250 (a)(1)	Y

	(2) contain chemicals expected to cause carcinogenic, mutagenic, tetragenic, or otherwise harmful effects to human health? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.6		Y
	(3) Create a public health hazard through encroachment on water supply or through contact recreation? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.6	18 AAC 70.250(a)(1)(C)	Y
	(4) meet human health and aquatic life quality criteria at the boundary of the mixing zone? **If no, mixing zone prohibited.**	Yes Fact Sheet Section 3.3.6	18 AAC 70.255 (b),(c)	Y
	(5) occur in a location where the Department determines that a public health hazard reasonably could be expected? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.6	18 AAC 70.255(e)(3)(B)	Y
Aquatic Life	Does the mixing zone…			
	(1) create a significant adverse effect to anadromous, resident, or shellfish spawning or rearing? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.250(a)(2)(A-C)	Y
	(2) form a barrier to migratory species? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7		Y
	(3) fail to provide a zone of passage? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7		Y
	(4) result in undesirable or nuisance aquatic life? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.250(b)(1)	Y

	(5) result in permanent or irreparable displacement of indigenous organisms? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.255(g)(1)	Y
	(6) result in a reduction in fish or shellfish population levels? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.255(g)(2)	Y
	(7) prevent lethality to passing organisms by reducing the size of the acute zone? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.255(b)(1)	Y
	(8) cause a toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.7	18 AAC 70.255(b)(2)	Y
Endangered Species	Are there threatened or endangered (T/E species) at the location of the mixing zone?If yes, are there likely to be adverse effects to T/E species based on comments received from United States Fish & Wildlife Service or National Oceanic & Atmospheric Administration. If yes, will conservation measures be included in the Permit to avoid adverse effects? **If yes, explain conservation measures in Fact Sheet. If no, mixing zone prohibited.**	Fact Sheet Section 3.3.8 and Section 8.1	Program Description, 6.4.1 #5 18 AAC 70.250(a)(2)(D)	Y